# Pit and Quarry

*With which is consolidated*

CEMENT-MILL & QUARRY

**March, 1934**



NRA

WE DO OUR PART

MAR 12 1934


## Full Circle Loading

*plus*

## Finger Tip Control

TRY to match the MICHIGAN for mobility!

Three little *control valve levers* cover the entire range of shovel action, permitting instant and effortless manipulation right at the operator's finger tips.

Quick transport from job to job under its own power, as well as easy maneuvering in close quarters for digging or dumping, is what gives the MICHIGAN TRUCK SHOVEL maximum flexibility and minimum shoveling costs.

Its extra speed, power and stamina, are important for economical work on widely scattered PWA or CWA jobs. Time is profit!

**Michigan Power Shovel Co.**

**Benton Harbor** **Michigan**

FULL CIRCLE LOADING — THREE QUARTER DIGGING — NO TAIL SWING

**Get the facts first—then decide. Descriptive bulletin sent on request.**

# MICHIGAN TRUCK SHOVEL


Pages 21-23

# Selfvulc

## Here's GOOD NEWS for Belt Users

BEFORE—Typical section of badly worn conveyor belt that looks "beyond repair."

AFTER—Same belt re-surfaced with SELFVULC and restored to use better than ever.

SELFVULC solves the belt problem by saving the cost of replacements!

This self-curing plastic rubber compound is a modern development of far-reaching importance to industry—a new aid to economy in this new day of efficiency.

Applied cold in paste form over worn spots, SELFVULC protects the fabric, provides a new wearing surface and prolongs the life of the belt, actually doubling its durability.

Your old conveyor belts, with the rubber worn away clear to the fabric—ordinarily ready to be scrapped—can now be reclaimed and restored to use simply by repairing and resurfacing with SELFVULC. Holes, gouges, tears and worn edges are easily repaired with SELFVULC. NOTE: When ordering, specify "F" bonding solution, the proper binder for FABRIC and RUBBER. Specify "M" primer for METAL, WOOD, etc.

SELFVULC is now used in scores of plants for repairing and resurfacing belts, covering pipes, lining chutes, protecting steel, wood, cement and brick surfaces—as a chute lining, it will outwear manganese steel and boiler plate many times over.

Give SELFVULC a try-out in your plant. You can save thousands of dollars on belt replacements by investing a few dollars in SELFVULC for making repairs. Take advantage of this special offer by mailing the coupon with your order today.

**NEW BELTS from OLD**

Selfvulc

SELF-VULCANIZING RUBBER CO., INC.
605 W. Washington Blvd., Chicago, Ill.

Gentlemen:

Please enter our order for one complete TRIAL OUTFIT No. 3 SELFVULC PLASTIC RUBBER COMPOUND at $37.50 F.O.B. Chicago.. Weight about 40 lbs..... Freight ..... Express.

Name of Company .....

Address .....

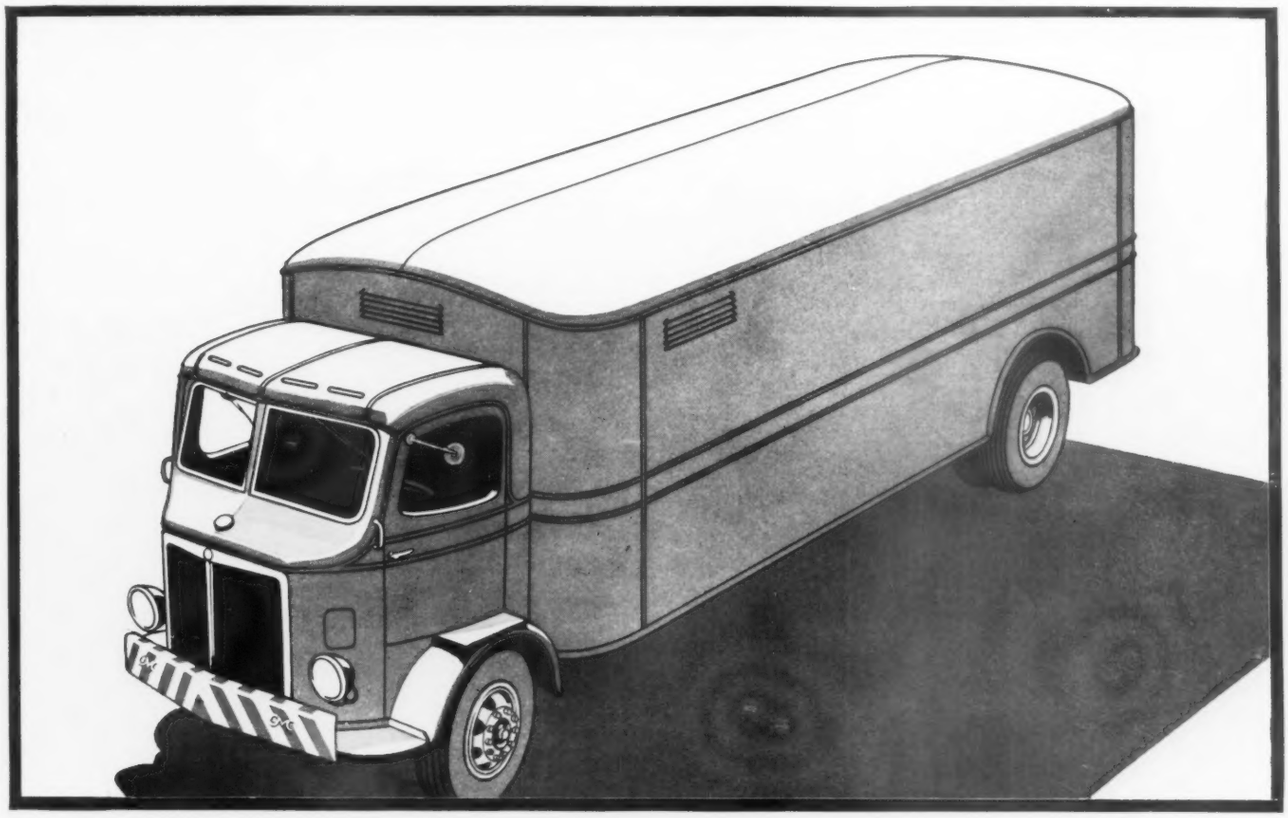
By .....

**37.50** for 25 lbs. of SELFVULC with cleaning fluid, primer and tools for applying.

## TRIAL OUTFIT

# ANNOUNCING THREE NEW
# GMC CAB-OVER-ENGINE TRUCKS

| T-73 | T-75 | T-78 |
|---|---|---|
| 15,000 lbs. gross rating | 24,000 lbs. gross rating | 30,000 lbs. gross rating |



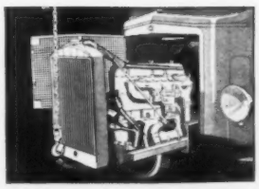
**IDEAL WEIGHT DISTRIBUTION ★ ★ MORE PAYLOAD ★ ★ SHORTER TRAIN LENGTH**

In these three new cab-over-engine models, the General Motors Truck Company accomplishes a radical improvement in load distribution. In addition, GMC cab-over-engine design also provides increased payload capacity for a given wheelbase.

As developed by GMC, this design meets every demand for power plant accessibility and easy maintenance, and for utmost driver comfort.

Each of the new models is powered by a GMC truck-built, 6-cylinder, valve-in-head engine. Each maintains the GMC standard of *highest sustained torque per cu. in. of displacement.*

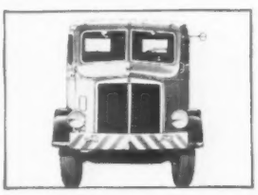
For complete details and prices, see the nearest GMC representative or write to the factory direct.



For major service, the entire engine rolls forward; it can be completely removed.

Adjustments can be quickly made by removing the engine cover inside the cab.

The cab is extra roomy and comfortable, with complete and modern ventilation.



Showing the clear vision and modern design, the grille giving access to the engine.

**GENERAL MOTORS TRUCKS and Trailers**

GENERAL MOTORS TRUCK COMPANY — *Time Payments Available Through Our Own Y. M. A. C.* — PONTIAC, MICHIGAN

# Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 26 March, 1934 Number 9

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published on the first of each month for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other non-metallic minerals. Entered as second-class matter November 28, 1932, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.



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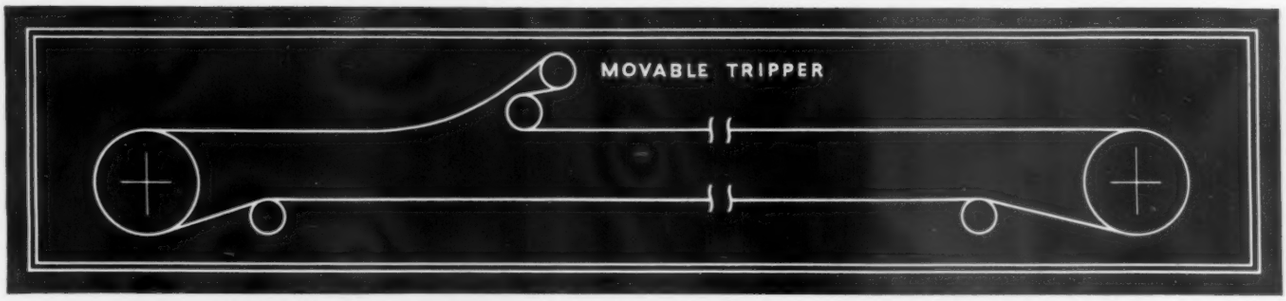
NRA MEMBER U.S. WE DO OUR PART

# BELT LASTS FROM '20 to '33




*Outline sketch of conveyor on which original Goodyear Belt gave 13 years of service*

## GOODYEAR CONVEYOR BELT GIVES 13 YEARS OF EXTRA-SATISFACTORY SERVICE

## A G.T.M. JOB

### Performance Left No Room for Doubt When They Finally Had to Order Again

Your conveyor belts have a tougher job to handle than this one was called on to do.

But the fact remains that when a belt does its job year in and year out for 13 years, it's a successful performer.

That's what this Goodyear Conveyor Belt did in the service of Callaway Fuel Company, Milwaukee, Wisconsin.

*Goodyear Conveyor Belt in the plant of the CALLAWAY FUEL COMPANY, MILWAUKEE, WIS.*

### THEY CALLED IN THE G.T.M.

The original installation here was based on a thorough analysis of the Company's requirements by the G. T. M.—Goodyear Technical Man. His expert recommendation was a Goodyear Style W Conveyor Belt, 480 feet long, 30-inch, 6-ply.

How well the G.T.M. judged the job and the belt may be read in the records recently reported by Mr. George C. Herrmann, Secretary of the Company, who writes that the belt served from early 1920 to July, 1933, and during that time conveyed 578,302 tons of coal.

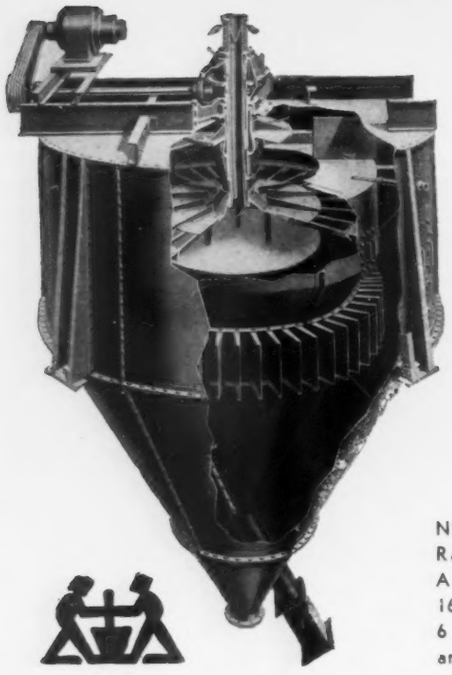
*"Very pleased with the results, we did not hesitate to specify a Goodyear when re-ordering,"* says Mr. Herrmann.

The G. T. M. may be able to save money for you or improve your equipment operation. You can get in touch with him through Goodyear, Akron, Ohio, or Los Angeles, Calif., or your nearest Goodyear Mechanical Rubber Goods Distributor.

**BELTS • MOLDED GOODS**
**HOSE • PACKING**
MADE BY THE MAKERS OF GOODYEAR TIRES

THE GREATEST NAME IN RUBBER

# GOODYEAR



Nine standard sizes of Raymond Mechanical Air Separators in 18 - 16 - 14 - 12 - 10 - 8 - 6 and 4-foot diameters, and 30-inch separator.

**BUILT IN SIZES**

# Supplying Every Need

RAYMOND offers to producers of powdered materials a full line of Mechanical Air Separators, meeting all requirements for

Capacities for large and small plants.
Classification for any kind of products.
Fineness range up to 350-mesh or better.
High efficiency in closed circuit operations.

These machines, as built today, represent the result of Raymond experience in hundreds of installations, and include the latest Raymond developments for insuring ease of adjustment, close control of the product and economical operation.

The patented WHIZZER is an exclusive feature that greatly increases output and maintains remarkable uniformity of particle sizes in the finished product. All Raymond Separators are equipped with whizzer blades, which afford important advantages in meeting difficult specifications, or in classifying special materials.

For reliability in operation and results, specify Raymond Mechanical Air Separators in classifying Clays, Chemicals, Food Products, Hydrated Lime, Gypsum, Mineral Fertilizers, Cement Raw Mix and Finish Clinker.

Write for catalog, "Handling Materials by Air," which describes various types of installations. RAYMOND BROS. IMPACT PULVERIZER CO., Main Office and Works: 1321 North Branch Street, Chicago. Sales Offices in New York and Los Angeles.

Laboratory size, 30 inches in diameter, for testing purposes or for handling small capacities, such as from screen mills.

**RAYMOND**

PULVERIZING, SEPARATING, AIR DRYING AND DUST COLLECTING EQUIPMENT

# LIMA brings new economies to dragline users . . . .

IS there any wonder that owners of LIMA draglines are enthusiastic about their machines? LIMA advantages are giving them new low figures on operating costs.

Take the drums for instance. Their extra wide face and exceptionally large diameters accommodate maximum cable lengths without double wrapping. This desirable feature plus the advantage of having the drag cable lead off the bottom of the drum to the fairlead (a distance of 7 feet) affords cable economy never before approached on dragline operations.

Other features which add to the efficiency of LIMA draglines are extra long crawlers with wide shoes and ample rake, large diameter boom point sheave with wide throat, abundant road clearance beneath crawlers, quiet, long-lived helical gears, and anti-friction bearings at every vital bearing point.

Before you buy your next dragline consider the savings these outsanding LIMA features will bring you.

## THE OHIO POWER SHOVEL COMPANY, Lima, Ohio, U. S. A.

DIVISION OF LIMA LOCOMOTIVE WORKS, INCORPORATED

CHICAGO
1543 Straus Bldg.

NEWARK, N. J.
317 Frelinghuysen Avenue

The General Supply Co. of Canada, Ltd.
Ottawa, Ont.

NEW YORK
167th Street and Sedgwick Avenue

MEMPHIS
77 McCall Street

SEATTLE
2244 First Ave. So.

Tyee Machinery Company, Ltd.
Vancouver, B. C.

DALLAS
1301 So. Lamar St.

SHOVELS
DRAGLINES
CRANES
BACKDIGGERS

LIMA

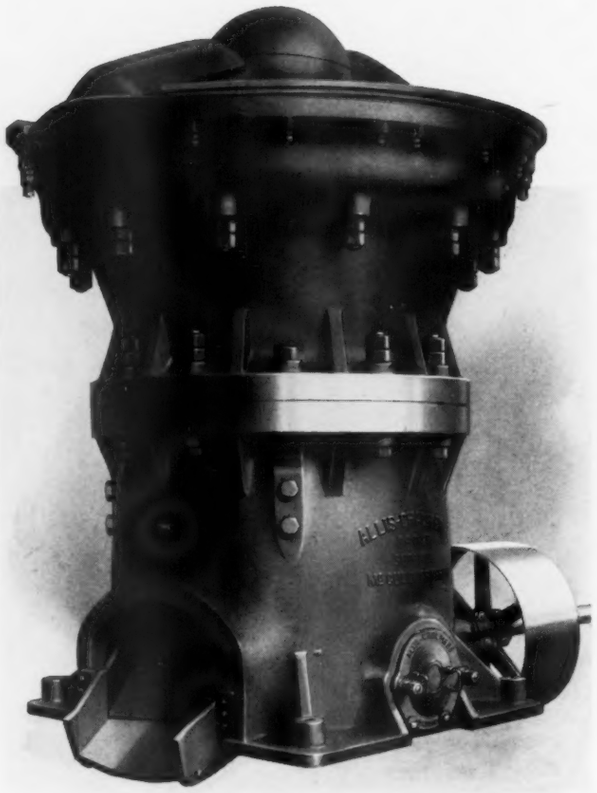
¾ YARD
1 YARD
1¼ YARD
1½ YARD
1¾ YARD
CAPACITIES

TYPES 302 - 404 - 502 - 601 - 701

# The Type of Crusher
## . . . . *to Suit Your Needs*

ALLIS-CHALMERS MANUFACTURING COMPANY has developed a line of crushing plant machinery which, with study and selection, will meet every possible combination of the varying factors of crushing plant operation in the most economical manner. As manufacturers of gyratory, jaw and roll type crushers, Allis-Chalmers is in a unique position; not being primarily interested in pushing the sale of any one of these types in preference to the others, our primary interest is always to help our customers solve their rock crushing problems in the most economical way.

Newhouse Crusher



36″ Superior McCully Crusher

TWO types of Allis-Chalmers crushers are illustrated here. The Superior McCully type (above) is the original short, heavy shaft gyratory greatly improved by constant development. The crusher is of rugged construction to withstand severe service. The lubricating system is simple and reliable and the eccentric dust seal is of an improved design. Built in many sizes from 8″ to 60″. (*Described in Bulletin 1472.*)

The Newhouse Crusher (left) meets every requirement of secondary crushing. It is a high reduction, large capacity unit with motor direct connected to drive shaft, and is well suited to fit into present installations. It requires little head room and may be suspended from the frame work of a building by cables. Built in four sizes, 5″, 7″, 10″ and 14″. (*Described in Bulletin 1469-C.*)

Bulletin 1473, just printed, describes the complete Allis-Chalmers line of crushing plant machinery. Write for your copy.

# ALLIS-CHALMERS

**Allis-Chalmers Manufacturing Company, Milwaukee**

# ONLY

## Brand of WIRE ROPE bears a SILVER STRAND

## . . . THE MARK OF SUPERIOR QUALITY!

As exclusive as the identifying "Silver Strand" is the superior performance and economy of Monitor Silver Strand Wire Rope. Made of the highest quality steel, it is brutally strong, to whip the toughest kind of jobs—while its great abrasion resisting qualities assure far longer life. If you are interested in lower operating costs and greater efficiency—if you want true and proved value—it will pay you to learn in detail what the "Silver Strand" means. Take advantage of the money-saving consultation service offered by our distributors and branch offices.

AMERICAN STEEL & WIRE COMPANY

# MONITOR

## SILVER STRAND WIRE ROPE

1831

1934

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

*Pacific Coast Distributors:* Columbia Steel Company, Russ Bldg., San Francisco

*Export Distributors:* United States Steel Products Company, New York

# For Sure-Fire economy *Safety Fuse*

Development of Safety Fuse has kept pace with modern engineering. For dry, damp, wet, or extremely wet work . . . whatever your specific requirements may be, they can be met with Ensign-Bickford Safety Fuse.

*Nine famous brands are available:*

GROUP I

Single Tape, gray—damp work
Double Tape, gray—wet work
Beaver, yellow—damp work
Crescent, white—wet work.

GROUP II

*(burn more slowly than those in Group I)*

Clover, white—very wet work, little smoke
Clover, Orange Wax—very wet work, little smoke, changes appearance while burning
Charter Oak, white—damp work
Charter Oak, gray—very wet work
Charter Oak, Black Wax—very wet work.

We have been making Safety Fuse *up-to-date* for 97 years. The Ensign-Bickford Company, Simsbury, Conn.

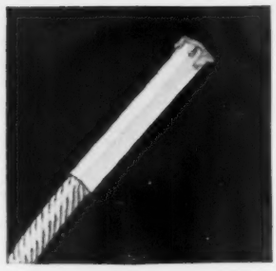
This book *shows how to prevent blasting trouble through the proper care and use of Safety Fuse. Sent to executives without charge.*

SF 25

**ENSIGN-BICKFORD**
**SAFETY FUSE**

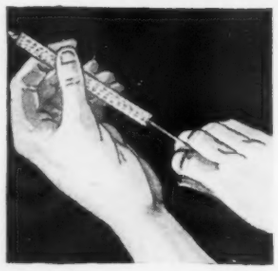
SAFETY FUSE MATCH LIGHTER

*A short paper tube that can be slipped over the freshly cut end of the fuse. One end of the tube is coated with the material that safety matches are made of. When you're ready to light the fuse, strike the tube with the edge of a safety match box, or light it with a match flame.*



PULL WIRE FUSE LIGHTER

*Cut the end of the fuse off squarely with a clean sharp knife, insert the fuse in the open end of the lighter until it lightly touches the end of the wire, then pull the wire. Ideal for use in the wind or rain.*



# For Sure-Fire Lighting

You *can* light safety fuse with a match. Slit the end of the fuse to the powder train, place the head of a match in the slit, and strike the head with a stone (or with the match box if a safety match). The flare of the head ignites the powder.

As a rule, operators have found it safer and more economical to use a fuse lighter. There are three excellent lighters available: the Hot Wire, shown here, which burns with an intensely hot ring of fire that ignites the powder; the Pull Wire, ideal for use in wind or rain, or when the flare and end spit should be confined; and the Fuse Match, which is struck like a match on any safety match box.

Lighters are cheap—and they pay their own way.

These pamphlets *give you the facts about these lighters and other Ensign-Bickford Blasting Accessories. Sent on request without charge.*

SF 24

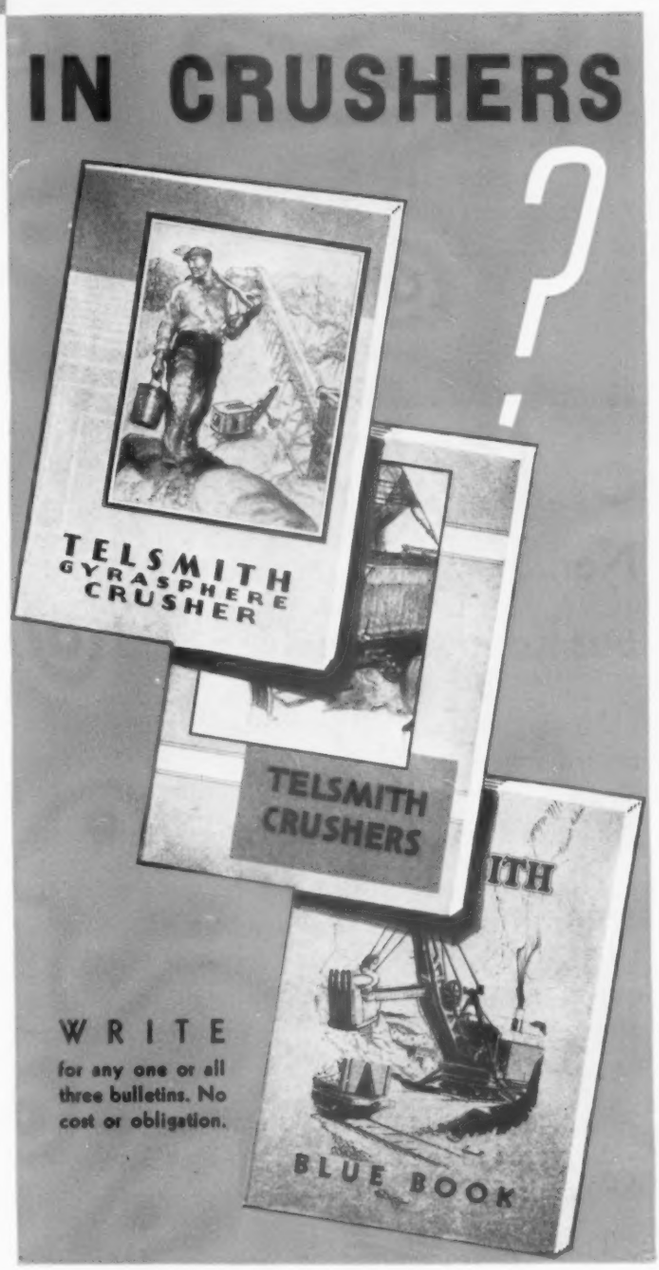
**ENSIGN-BICKFORD**
**FUSE LIGHTERS**

# *Do you know* WHAT'S NEW IN CRUSHERS?

THAT crusher you have may be pretty good; but you should see how they build crushers *now*. Crushing practice has been changing rapidly in recent years. There are new machines on the market and you really should know what they're like—whether you are planning to buy or not. Here are three bulletins that will give you all the latest "dope."

Depression years have given Telsmith engineers the chance they had been waiting for—to do a lot of research and to expand Telsmith engineering facilities. They have redesigned Telsmith crushers to work faster . . . crush more rock . . . last longer . . . cost less in upkeep.

How? That and all your other questions are answered in these crusher books . . . with facts and photographs presented in a way you'll like. The three bulletins are—No. C-15 Telsmith Crushers (Primary Breakers and Reduction Crushers); No. Y-15 Telsmith Gyrasphere Crusher; No. Q-15 Telsmith Blue Book (Plant Layouts). And they're yours *without cost or obligation*. Better write for all three.




SMITH ENGINEERING WORKS

504 E. CAPITOL DRIVE, MILWAUKEE, WISCONSIN

**TELSMITH**

50 Church Street, New York City
211 W. Wacker Drive, Chicago, Illinois
7116 Lincoln Drive, Philadelphia, Pa.
1109 Statler Bldg., Boston, Mass.
412 Westinghouse Bldg., Pittsburgh, Pa.
Milburn Machinery Co., Columbus, Ohio
Brandeis M. & S. Co., Louisville, Ky.
Choctaw C. & M. Co., Memphis, Tenn.

# Install a Pre Cote Plant--
# Benefit By Proved Technique

A boulevard surfaced with two inches of Pre Coted stone carrying 6,906 vehicles in eight hours.

Another boulevard, surfaced with two inches of Pre Coted stone over old bituminous macadam carrying 2,552 cars in eight hours.

## Over 400,000 Tons for Long-Life, Non-Skid, Higher Quality Bituminous Roads Have Been Laid in 3 Yrs.

Now you can sell pre-mixed bituminous-coated aggregate for state, county, township and city roads—at an extra profit—one for your aggregate and one for your finished product.

The method is simple—yet the most accurate devised. Instead of considering weights of materials, it takes into account the *area* of the aggregate to be coated. The bituminous coat is always uniform, and may be adjusted to meet conditions.

The emulsions are always fresh and uniform—delivered to the coating machine direct from the emulsifier.

The Pre-coated aggregate is easy to ship, dumps readily from trucks, and is easy to lay. It can be placed, rolled, and opened to traffic in the same day—

Further information sent without obligation.

**PRE COTE CHEMICALS, Inc.**
**2917 Northwestern Ave. Indianapolis, Ind.**

## WHAT OFFICIALS SAY—

"We have used Pre Cote on our boulevard for three miles of 18-foot width on top of a rock base which had been previously treated with emulsion and permitted to settle under traffic during the winter. This material worked out ideally, giving us a rough textured surface with excellent riding qualities, made with the minimum of labor and machinery, and after two years of service is in perfect condition.

"Our maintenance in the meantime amounting to not more than $10.00 per mile and traffic being better than one thousand cars a day."

**County Highway Commission.**

★ ★ ★ ★

"The Contractor did a very high quality of work in the construction of the project; so much so that we consider that stretch of bituminous surfacing the best of our approximate 1,500 miles of bituminous surfaced highways.

"The project has a very high class riding quality and is in first-class condition today. Our highway commission and officials are very much impressed with the quality of that project and undoubtedly will construct similar projects during 1934."

**State Highway Department.**

★ ★ ★ ★

"Relative to your inquiry as to pavements constructed by the Pre Cote method of using emulsified asphalt, will say that we have about 85,000 square yards of pavement laid under this process.

"These pavements have given excellent satisfaction and the riding qualities have not been surpassed by the use of any other method or materials."

**City of Over 300,000.**

★ ★ ★ ★

"Here Pre Cote has been put down by competent men thoroughly familiar with bituminous work of this nature, as all bituminous work should be put down. There are two features of Pre Cote work that to my mind are outstanding. First, aside from the manufacture of emulsion on the job, the process is quite simple and direct, hence economical. Under competent hands the emulsion can be varied to fit the needs of the job, as they may vary or change from time to time. Second, the nature of the product permits easy and ready handling, which facilitates easy spreading and the construction of a smooth riding surface."

**State Highway Department.**

★ ★ ★ ★

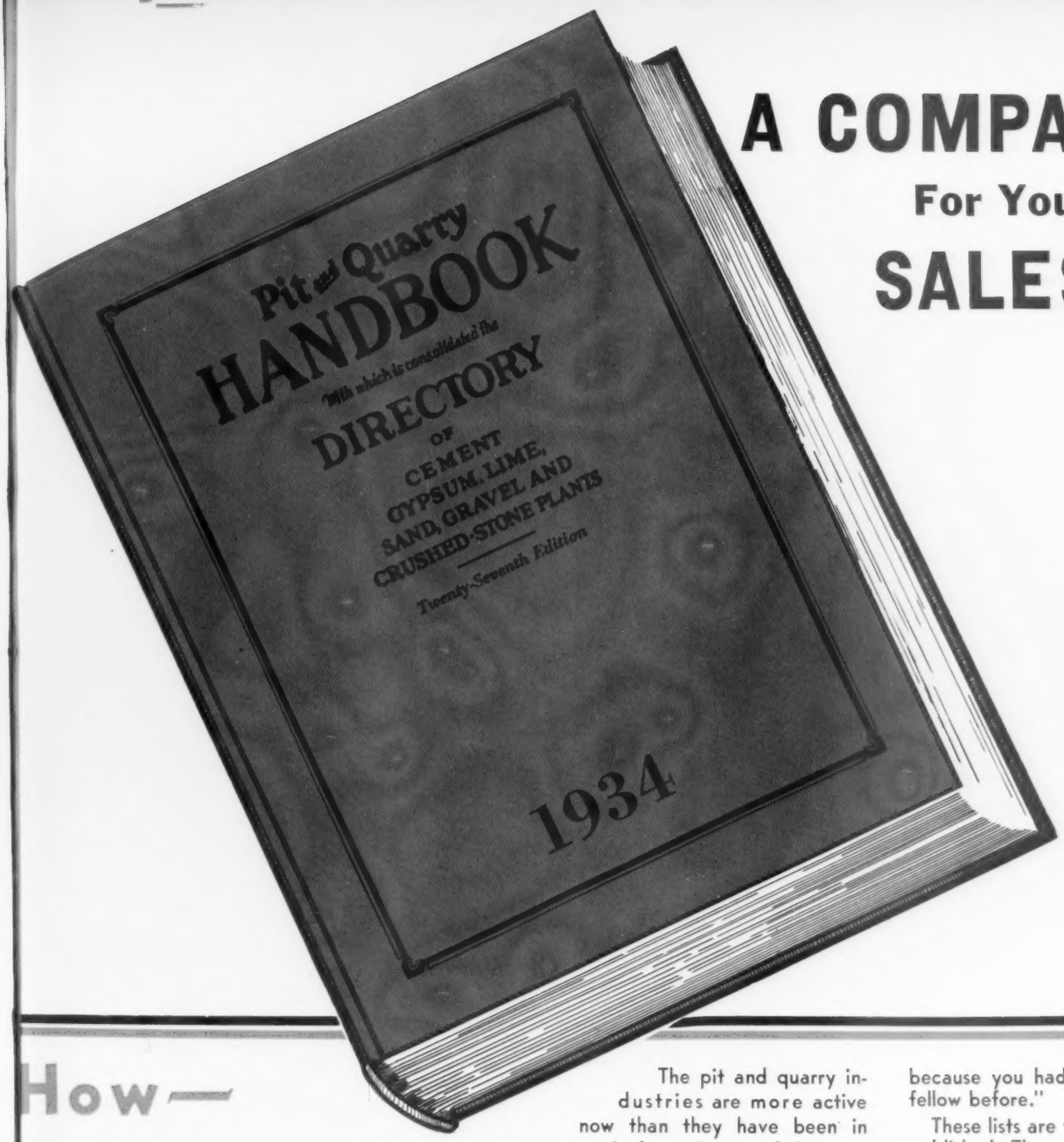
"Your letter of November 15th, 1933, with regard to Pre Cote asphaltic emulsion received. The Park Board has laid about two miles of this on old Macadam pavement and it has given satisfaction under heavy travel."

**City of Over 300,000.**

★ ★ ★ ★

"Since the original application, we have used this method of filling in around rail joints in pavement and have found it more satisfactory than using brick which we were formerly accustomed to do. So far our experience in the use of Pre Cote has been very satisfactory."

**Street Railway Company.**




# A COMPANION For Your SALES KIT

## How—

*—accurate and complete are your prospect lists?*
*—much "deadwood" is there on your prospect lists?*
*—much do you know about your prospects?*
*—much do you waste per year on poor lists?*
*—many "not there" calls do your men make?*
*—much do you know about new developments?*

The pit and quarry industries are more active now than they have been in years. In fact, it's one of the most active fields in industry. It's natural. For before the roads, dams, bridges, buildings, etc., can be built under the public works program the raw material has to be furnished.

Get your share of it. Don't miss fire with poor prospect lists. Don't lose sales because you had "never heard of that fellow before."

These lists are the most complete ever published. They contain hundreds of new names. They have been completely revised—all listings have been brought up to the minute.

Regardless of whether your territory covers only one state or the whole country the investment in a copy of Pit and Quarry Handbook is something that will pay big dividends—in sales.

## To Delay Is to Lose Sales—The Field Is Active—It Is Buying—Order This Selling Helper Today

PIT AND QUARRY
538 S. Clark St., Chicago, Ill.

As Soon As Published:

☐ Send ..... copies of the 1934 Pit and Quarry Handbook and Directory ($10.00 per copy).
☐ Send ..... copies of the separately bound Pit and Quarry Directory ($10.00 per copy).
☐ Remittance Enclosed. ☐ Will Remit Promptly on Receipt of Invoice.

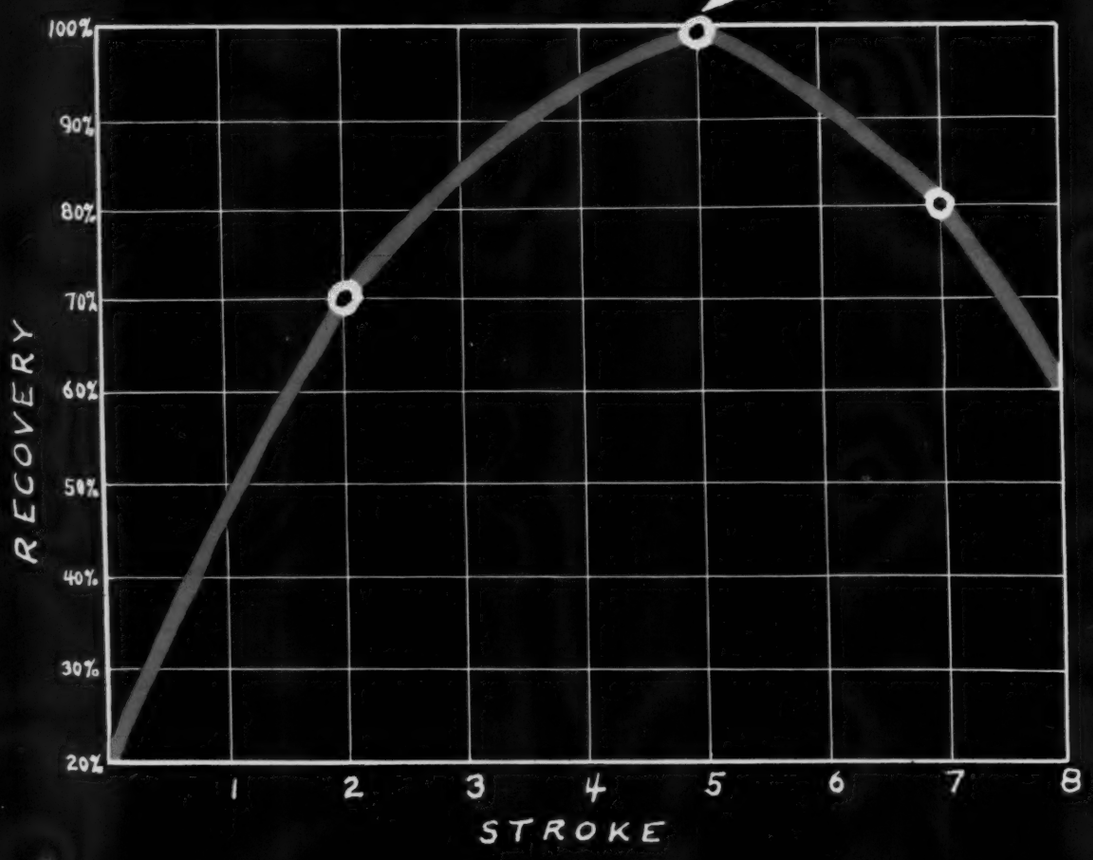
My Name ..... Title .....

Firm .....

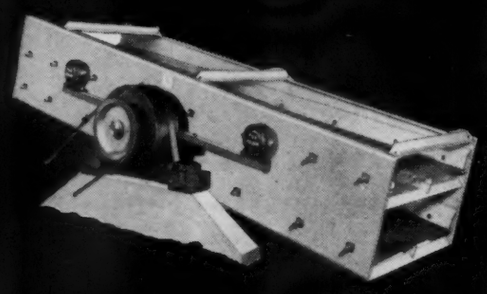
Address .....

3-34

# Is Your Screening Efficiency Here




## The JIGGER with CONTROLLED VIBRATION Assures Maximum Efficiency



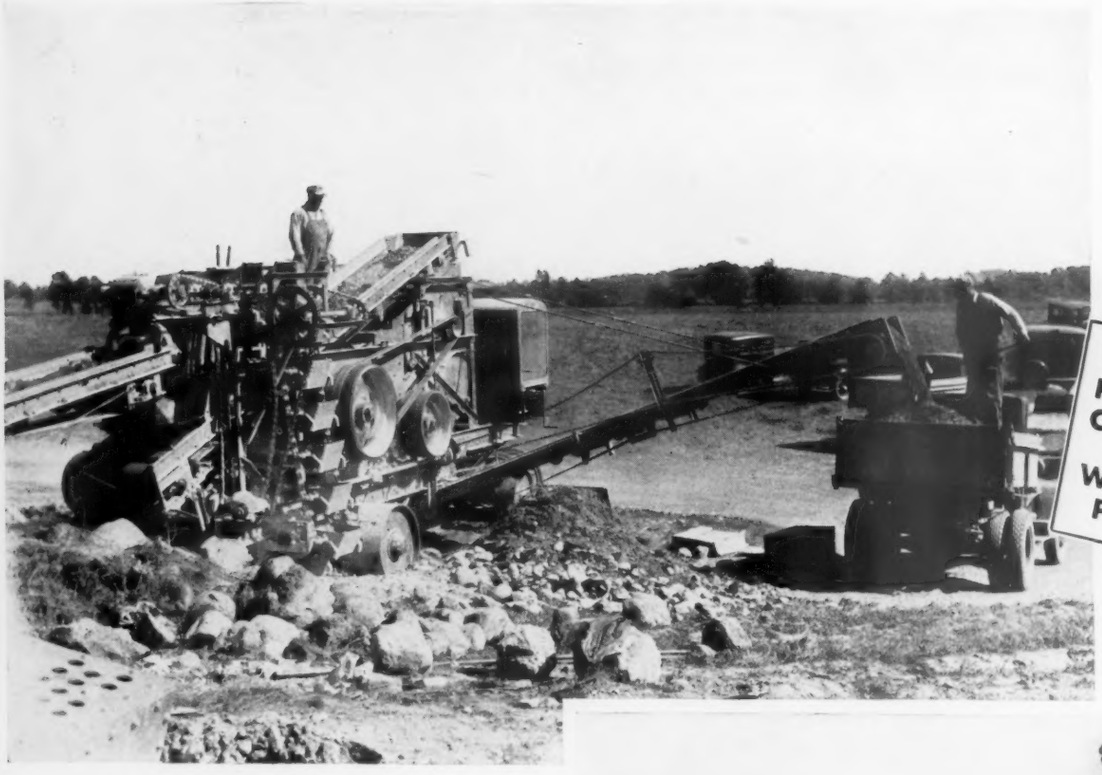
*The Only Machine with a Positive Adjustable Throw*

WRITE FOR MORE INFORMATION

**PRODUCTIVE EQUIPMENT CORP.** 210 E. Ohio St., Chicago, Ill.

# ON THE JOB..NEAR THE JOB..

## PRODUCING GRAVEL AT LOWEST COST BY ACTUAL TEST



**WESTERN PORTABLE CRUSHING AND WASHING PLANTS**

● The economy of portability—producing aggregate accurately sized and perfectly washed *on the job*—is only the first step to new savings with this equipment. Western Portable Crushing and Washing Plants have been operated side by side with similar equipment in the same pit under identical conditions. Records of such tests show that, not only in operating cost alone, but including the initial equipment cost, the Western plant does a better job for less money.

● County highway officials will be quick to recognize the importance of lowered production costs. The advantages to the contractor of economical portable equipment producing aggregate exactly to specifications, on or near the job, can make the difference between winning and losing bids—and profit or loss on contracts. Send the coupon for details.

**The Austin-Western Road Machinery Co.**
400 N. Michigan Ave., Chicago, Illinois
*Branches in Principal Cities*

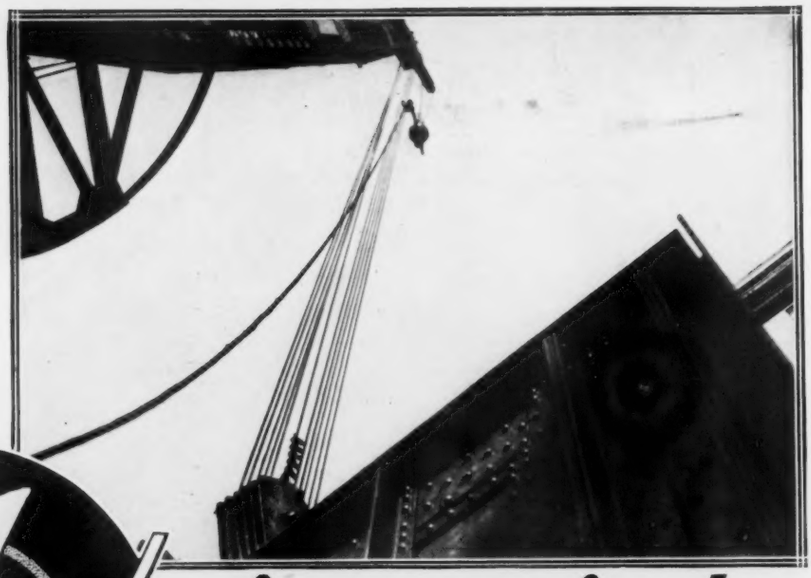
NRA WE DO OUR PART

**Austin-Western**

ROAD ROLLERS, CRUSHING & SCREENING PLANTS, SCARIFIERS, SWEEPERS & SPRINKLERS, ROAD GRADERS, ELEVATING GRADERS, MOTOR GRADERS, DRAGS, SHOVEL WAGONS

The Austin-Western Road Machinery Co.
400 N. Michigan Ave. A7, Chicago, Ill.
Please send details on Western
Portable { Crushing Plants ☐
Washing Plants ☐
Name _____
Address _____ State _____
City _____

**Cletrac Tractors**
Sold and serviced in this territory by Austin-Western



# Good wire rope is cheapest any way you figure it

When you are operating in heavy going you want to use dependable wire rope and you want to KNOW you're using it.

Taking chances should be confined to forms of gambling where human life is not at stake.

You'll find in Williamsport Wire Rope a small "Telfax" tape, which tells facts about the kind of steel used in that particular rope—That's important because it means SAFETY—It means you KNOW whether you are getting a rope of low tensile strength into service where one of high tensile strength is required. You just cannot get this in any other make of rope but Williamsport.

It's worth to you MORE THAN THE ROPE COSTS, but it costs nothing extra. Just specify Williamsport—That's all you need to do—and for your own protection it is worth doing.

Let us tell you about our Form-set ropes, the new idea in Preformed wire rope.

## WILLIAMSPORT WIRE ROPE COMPANY

*Main Office and Works*
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122 So. Michigan Ave.
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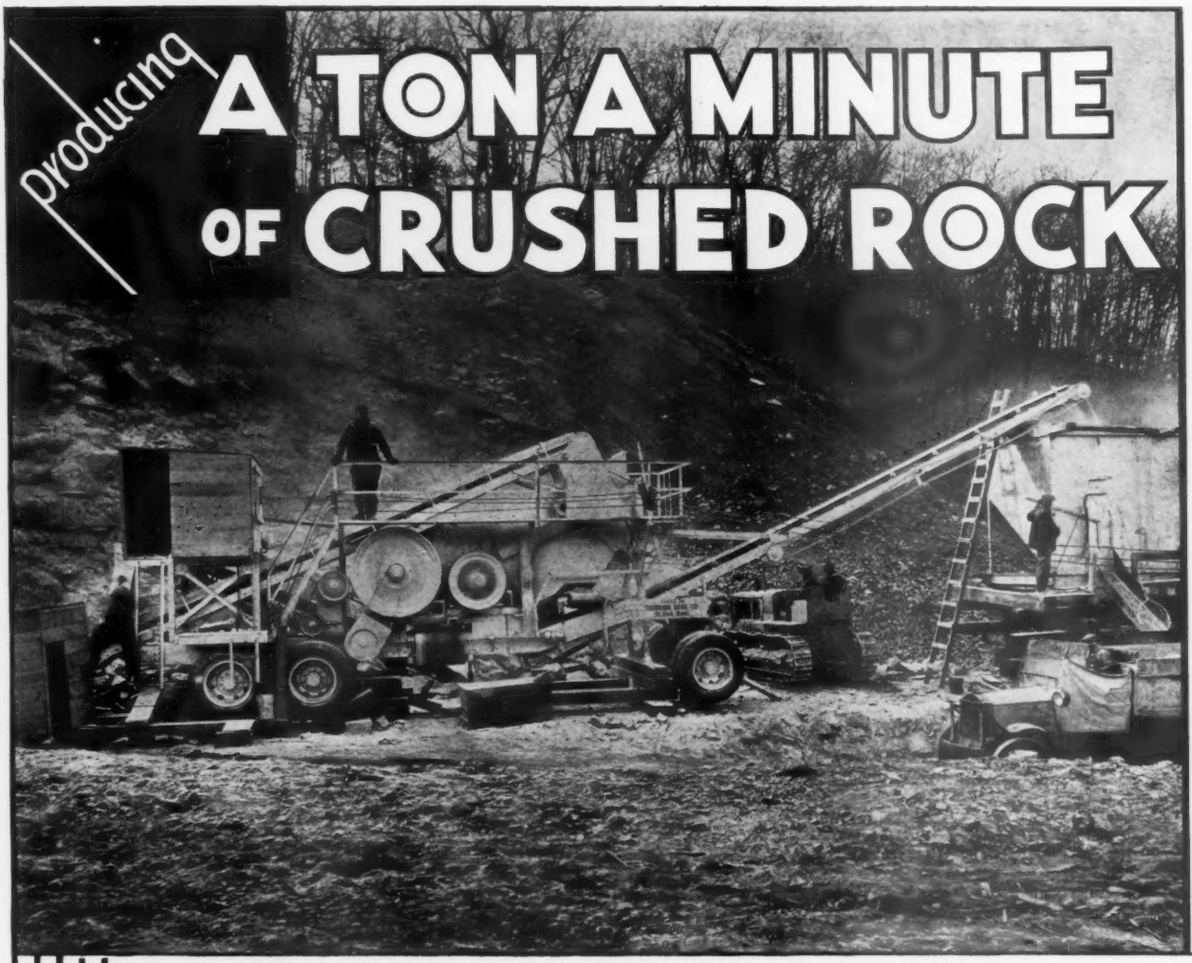
Producing

# A TON A MINUTE OF CRUSHED ROCK



## With a New "CEDAR RAPIDS" STRAIGHTLINE PLANT

This is what Thornton Brothers of St. Paul, Minnesota are doing with their "Cedar Rapids" plant. Its dependable performance is what makes for volume production and greater profits. That is why so many contractors are buying this "all purpose" Straightline plant. The features of these plants are:

1. Maximum portability—no conveyers to set up. All units mounted on one truck chassis.
2. Low operating cost—one man runs machine.
3. Large capacity—evidenced by outstanding performance in all sections of the country.

They are made in a wide range of sizes from 916 to 936, and for jobs requiring a maximum capacity, the 936-336 Tandem Plant, as shown above. All of these plants may be arranged for either dragline or trap feed.

Complete specifications on request. Use the coupon.

A PRODUCT OF THE

## IOWA MANUFACTURING CO.

CEDAR RAPIDS IOWA

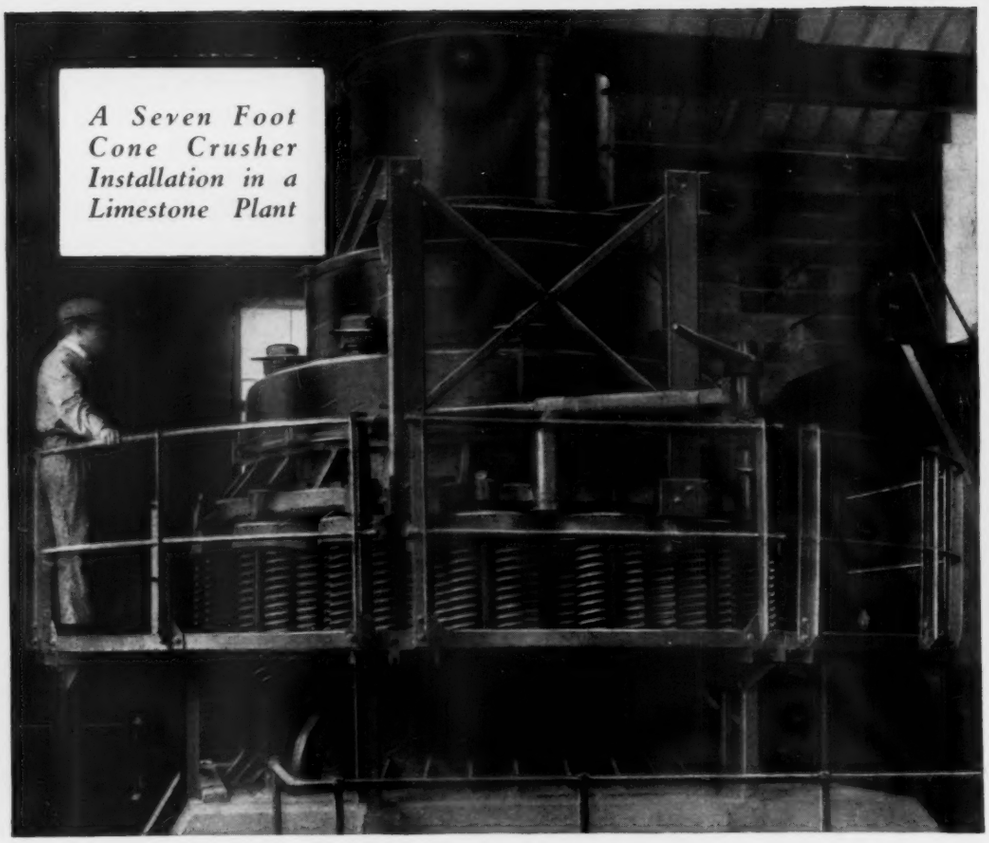
WITHOUT OBLIGATION—Send me your New Bulletin on THE NEW "CEDAR RAPIDS" STRAIGHT LINE ALL PURPOSE PLANT

Name.....

Address.....

City..... State.....

NRA U.S. WE DO OUR PART



*A Seven Foot Cone Crusher Installation in a Limestone Plant*

# LEADING THE FIELD
## In Fine Reduction Crushing

For producing in quantity such crushed materials as stone, gravel, slag and ores, the Symons Cone has demonstrated its superiority as compared with other types of crushing equipment. For capacity at lower crushing cost, it stands without an equal.

Whether the demand for materials requires a crusher of the large 7 foot size, or one as small as the 2 foot, and since they are now available in both the standard and Short Head Types, any fine crushing problem can be met with these machines. In these days when it is more important than ever to modernize to meet the changing times, the advantages of the Symons Cone deserve the careful consideration of every producer of materials.

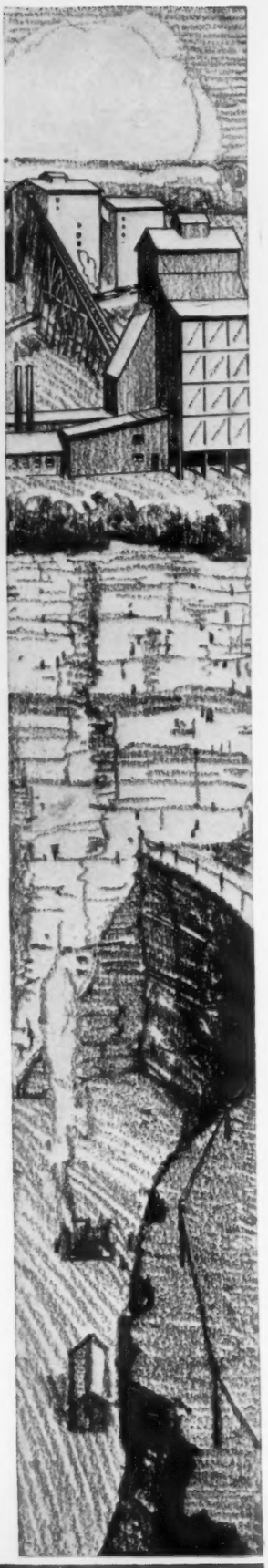
## NORDBERG MFG. CO.

**MILWAUKEE, WIS.**

**NEW YORK**
60 E. 42nd St.

**LONDON, ENG.**
Bush House

**LOS ANGELES**
Subway Term. Bldg.



**SYMONS CONE CRUSHER**

(*Above*)

Notice that practically no gases are getting away in the air—all the explosive gases are confined and working to produce rock.

(*Below*)

The balanced power of Apex stresses burdens to produce breakage that gives the shovel man a "break"

# The Ohio Blue Limestone Co. Recognizes the *Balanced Power* and *Controlled Force* of

# APEX

We've told you in other advertisements what the new action of Apex means. We *show you* in this one what Apex actually accomplished for the Ohio Blue Limestone Co. Two photographs tell the story. That of the blast makes clear the value of the pushing action of Apex—the absence of stone throwing and gas throwing. The after-blast picture shows how Apex stresses burdens and causes favorable breakage.

Written records were equally remarkable. The place—Marion, Ohio. During the period records were kept eight shots were made—33,616 pounds of Apex were used—157,461 tons of rock were produced.

The savings were amazing: 41.8% increased rock production per pound of explosive used; 38% greater spacing; 38% decrease in drilling costs. The use of less than 100 pounds of dynamite for secondary blasting throughout the entire period indicates *further savings* in shovel costs, in crusher costs and labor.

Let the Atlas representative arrange a demonstration for you.

**ATLAS POWDER COMPANY**

***A Proper Explosive for Every Blasting Requirement***

**WILMINGTON · DELAWARE**

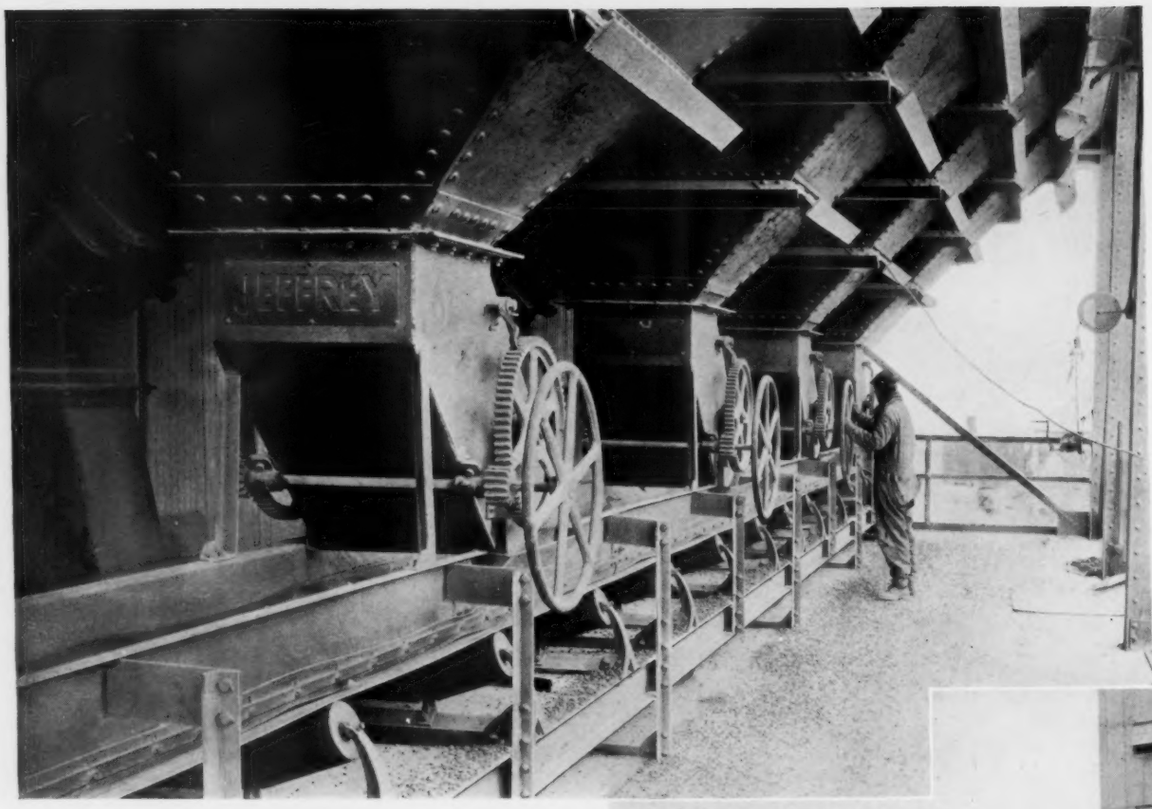
**Cable Address—Atpowco**

**BRANCH OFFICES:**

**Allentown, Pa., Boston, Mass., Denver, Col., Houghton, Mich., Joplin, Mo., Kansas City, Mo., Knoxville, Tenn., Memphis, Tenn., New Orleans, La., New York, N. Y., Norristown, Pa., Philadelphia, Pa., Pittsburg, Kansas, Pittsburgh, Pa., St. Louis, Mo., Tamaqua, Pa., Wilkes-Barre, Pa.**

ATLAS EXPLOSIVES

# ATLAS EXPLOSIVES




# *AGAIN...*

# JEFFREY is First Choice

Today efficient plant operation is more imperative than ever. Often the investment of a few dollars in equipment properly designed and applied brings big returns.

That the Great Lakes Steel Corporation selected Jeffrey Equipment for its slag crushing plant is simply a reflection of the economy, dependability and longer wearing qualities of Jeffrey Material Handling Units. Equipment was required which would stand up under the severest requirements without need of frequent repair, and give the length of service desired . . . Jeffrey, of course, was first choice.

Those plants that have installed Jeffrey Elevating, Conveying and Transmission Machinery have not only speeded up production but have made a noticeable decrease in their repair costs.

Jeffrey Engineers will help you select the right type of mechanical equipment from the complete Jeffrey line . . . and aid you to put your plant on a more efficient and cost-saving basis.

Write for complete information.

## The Jeffrey Manufacturing Company

**917-99 North Fourth St. Columbus, Ohio**

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|---|---|---|
| New York | Buffalo | Birmingham |
| Philadelphia | Cincinnati | Denver |
| Boston | Detroit | Dallas |
| Pittsburgh | St. Louis | Salt Lake City |
| Scranton | Chicago | Rochester |
| Cleveland | Milwaukee | Huntington, W. Va. |

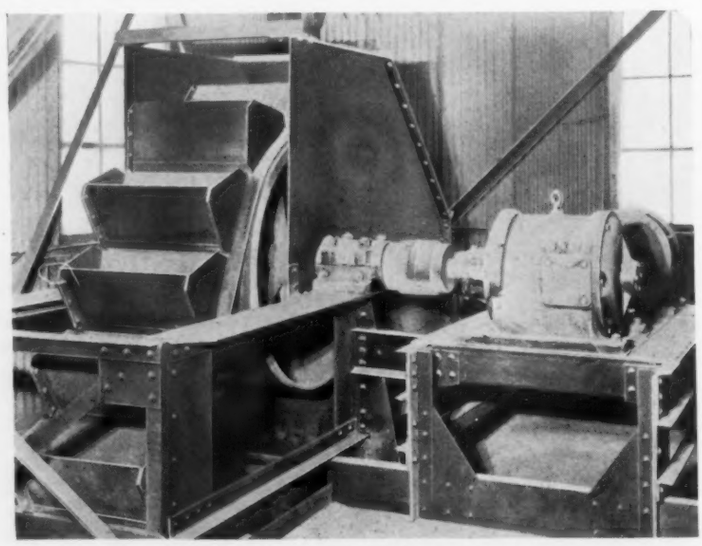
Jeffrey Mfg. Co., Ltd. of Canada

Head Office and Works—Montreal

Branch Offices: Toronto—Calgary—Vancouver

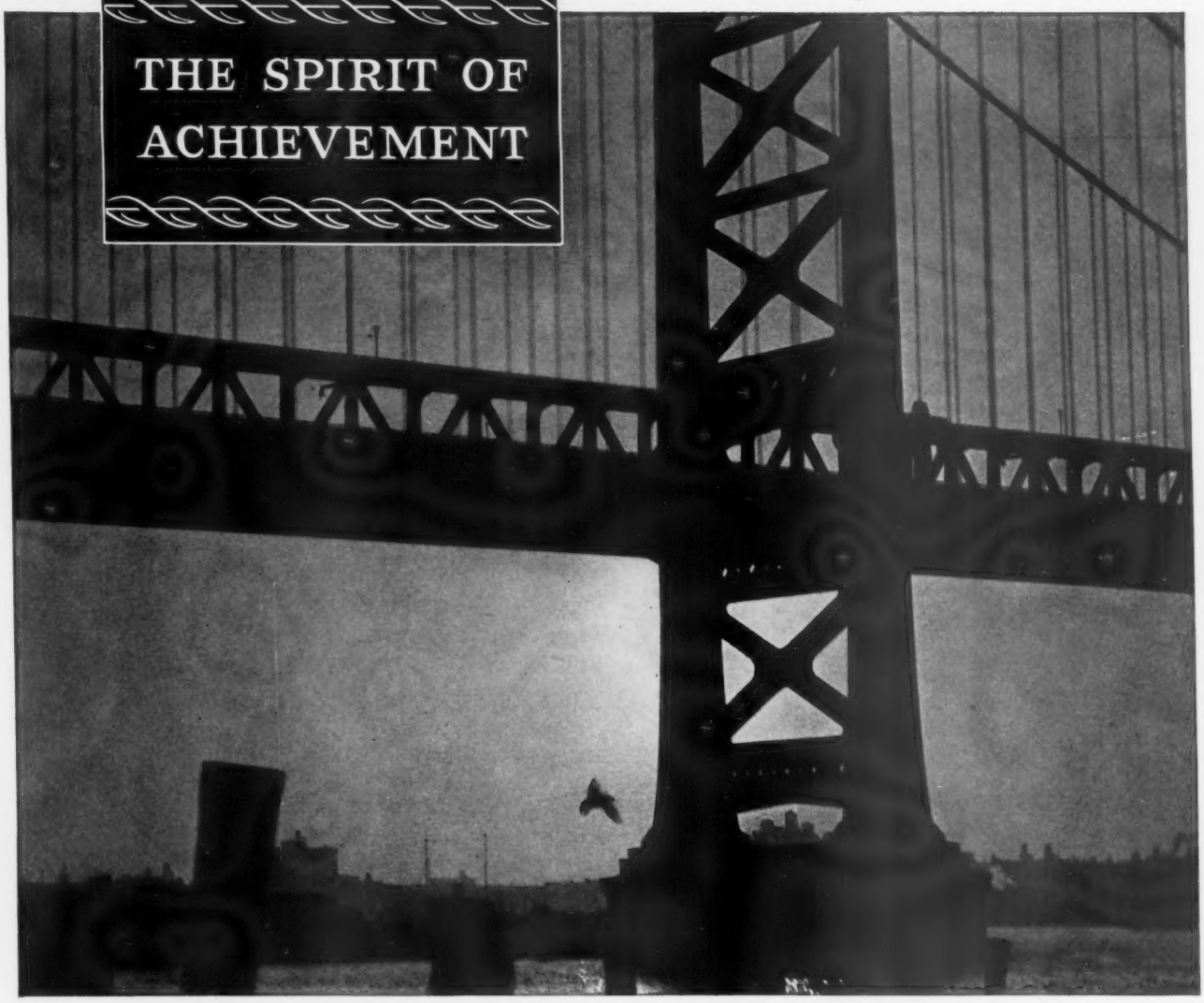
*Large view shows a Jeffrey Mixing Belt Conveyor and four of the five gates from the storage bins. Jeffrey Reliance Belt Idlers are being used and they have many new and advanced features, developed to improve strength, wearing quality and performance.*

*View next above shows a Jeffrey Steel Apron Conveyor handling slag from the track hopper to the plant. Jeffrey Steel Apron Conveyors operate on incline, horizontal or both.*



*The view above is a close-up of the Jeffrey 26" Inclined Bucket Elevator. Note that the buckets are riveted to the belt. Head frame and drive are also shown.*

# THE SPIRIT OF ACHIEVEMENT



*Howland Pike presents an unusually artistic photograph of the Delaware River Bridge which connects Pennsylvania with New Jersey at Philadelphia and Camden*

*Thermoid products are engineered with the same spirit of achievement that has produced the world's great bridges*

The imposing appearance of a gigantic bridge will impress all who see it as a remarkable engineering achievement. The imposing *performance* of Thermoid products will be *equally impressing* but only to those who use them.

It requires engineering ability of high order to span a mighty river and carry the tremendous traffic of two great states. It requires engineering ability of high order to successfully meet the requirements of the user of belting, hose and packings.

Every product that bears the Thermoid name is the result of skilled engineering and thorough field testing. Every product that carries the Thermoid trade-mark carries it not as a brand of identification but as a *certification* of merit. *Buy by that quality mark!*

**THERMOID RUBBER COMPANY**

*Factories and Main Offices:* TRENTON, NEW JERSEY

**Thermoid**

**BELTING**

**HOSE and PACKINGS**

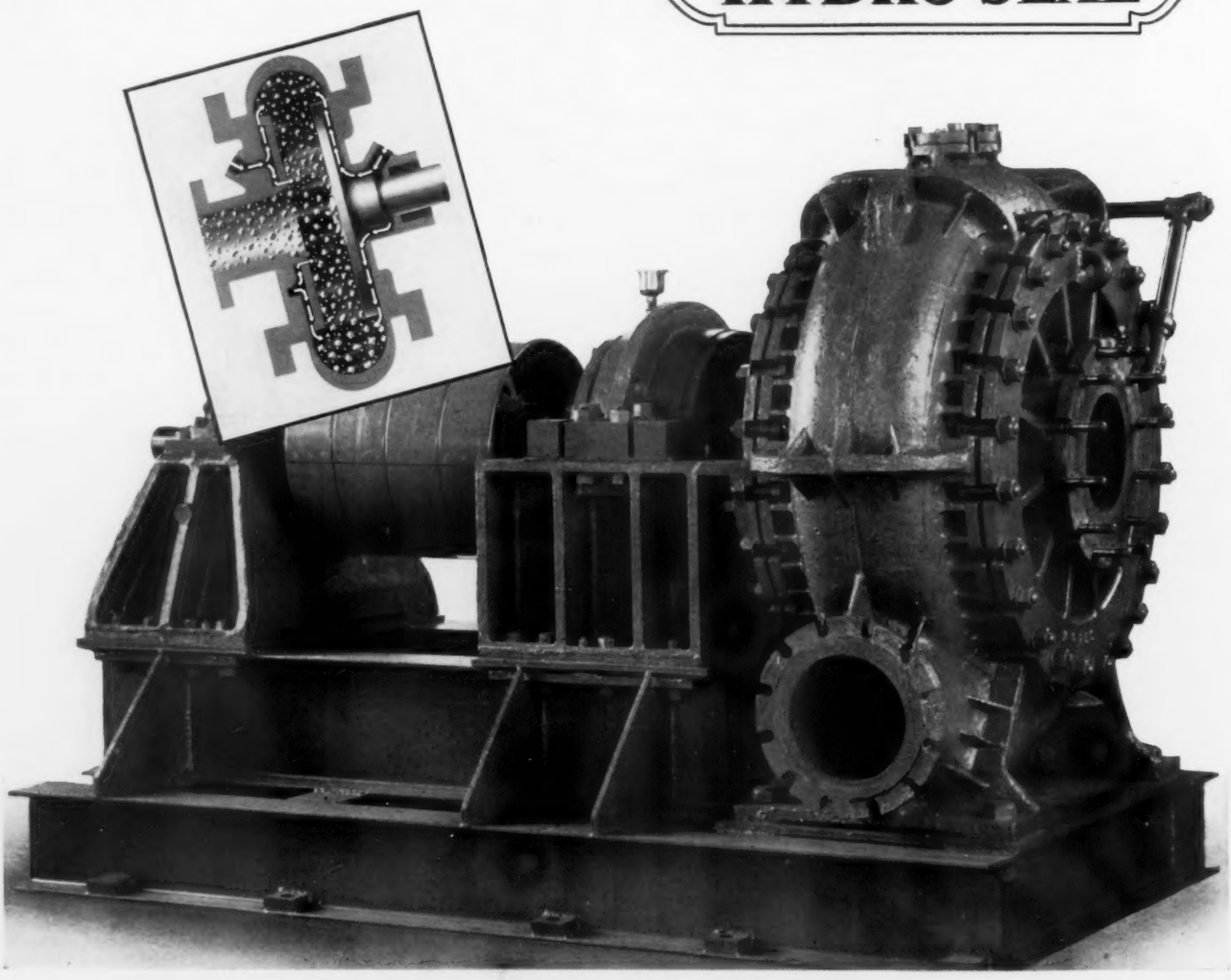
# *New!*

# SIMPLICITY

## *in a Proved Design..*

Power economies up to 30% and 40% are made by plants using the Hydroseal Dredge Pump, and in order to make these power economies sure, no matter what the installation conditions may be, we have simplified its design and made its power saving operation fool-proof . . . The same Hydroseal principle of introducing clear water on each side of the impeller (see diagram) still produces efficiencies of 50% or more, and prevents abrasive wear between the impeller and pump side plates . . . Among the numerous new improvements is the use of our new rubber mixture, which we call "Maxamix", for the Automatic Seals. This was developed specially for dredging conditions and it will far outlast even the impeller . . . Write for complete information about the NEW Hydroseal Pump, for its new design alone will convince you how it will pay for itself in a few months' time. The Allen-Sherman-Hoff Company, 223 South 15th Street, Philadelphia, Pennsylvania. Offices in all principal cities.

**HYDRO SEAL**



VOLUME 26 NUMBER 9

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, MARCH, 1934

## Santa Cruz Announces Extension of Program

PLANS SIX DISTRIBUTING PLANTS

The Santa Cruz Portland Cement Co., Santa Cruz, Cal., which some months ago started work on an extensive construction program for the water shipment of its cement, has revealed its complete program. The entire project, it is estimated, will cost in the neighborhood of $1,500,000 and is hailed by Pacific Coast newspapers as one of the largest private expansion projects undertaken in the Far West in the last few years. The entire project calls for a 2500-ft. steel pier and storage silos at the plant, the conversion of a steamer to a self-unloading boat with a capacity of 40,000 bbl. of cement, and the construction of storage and packing plants at Stockton, San Francisco, Oakland and San Pedro, Cal., Portland, Ore., and Honolulu, Hawaii.

The steamer "Pacific Cedar," which was purchased last August, is now being reconditioned and converted at Chester, Pa.; the dock at Santa Cruz is rapidly nearing completion and the silos there have been in use since Feb. 1 for rail shipments of bulk cement pending the completion of the pier. The storage silos and packing plant at Stockton are under construction and property has been purchased on the Willamette River, Portland, Ore., for the storage and packing plant there, construction of which will start immediately, according to an announcement by the company. It was also announced that construction of the San Pedro and Oakland plants will begin immediately. No definite date was given for the construction of the San Francisco and Honolulu plants. All handling of cement to and from the Santa Cruz dock and silos and to and from the boat and distributing plants will be done with pneumatic pumping systems.

## Cement Producer Makes Improvements at Plants

★ The Ash Grove Lime & Portland Cement Co. recently purchased a new 20-ton standard gauge Plymouth locomotive for its cement plant at Louisville, Nebr. It is also reported that a construction program to be begun soon at the Chanute, Kans., plant will call for the erection of five additional cement storage silos with a capacity of 20,000 bbl. each and other improvements.

## Cement Trade Mourns Passing of H. L. Block

The cement industry lost a pioneer and one of its most important figures in the recent death of H. L. Block, president of the Missouri Portland Cement Co., St. Louis, Mo. Mr. Block passed away on Feb. 6, 1934 at his residence in St. Louis of heart disease after an illness of several months. He was born on a farm in Pike County, Mo., on March 15, 1863 and was 70 years of age at the time of his death.

Mr. Block organized the Union Sand Co. in 1892, this company later changing its name to the New Union Sand Co., and still later to the Union Sand & Material Co. This company acquired the St. Louis Portland Cement Co. in 1907 and the Kansas City Portland Cement Co. in 1908, and in 1917 changed its name to the Missouri Portland Cement Co. Mr. Block has served as president of these companies since their organization in 1892. He had also served on the board of directors of the Portland Cement Assn. for many years and was treasurer of the association in 1933. He also served at various times on many special committees.

## New Concrete Producer Operates in New Jersey

★ The Colonial Concrete Co., a new concern manufacturing and distributing truck-mixed concrete has been established at the Orange quarry in West Orange, N. J. The new company is headed by Harry J. Axt and Adolph R. Frank, formerly sales and production managers, respectively, for John P. Callaghan, Inc.

★ The Tavern Rock Sand Co., Toledo, O., has purchased a 9-ft. standard chaser mill from the Lewiston Foundry & Machine Co., for its plant at Enterprise, Ky. This mill will take the silica rock from the primary crusher and reduce it to the desired fineness for glass sand.

## Many Cement Plants Reopen in February

IMPROVEMENT OVER 1933 EVIDENT

The unseasonal operation of many cement plants which ordinarily shut down for several months during the winter season and the steady reopening of plants which had shut down earlier indicates the attitude of the industry regarding prospects for Spring business. In addition to the plants reported as having resumed operations in earlier issues the following plants have also resumed during the past month: Lehigh Portland Cement Co., Oglesby, Ill., and New Castle, Pa.; Manitowoc Portland Cement Co., Manitowoc, Wis.; Universal Atlas Cement Co., Duluth, Minn.; Arkansas Portland Cement Co., Okay, Ark; Alpha Portland Cement Co., La Salle, Ill. The Beaver Portland Cement Co., Gold Hill, Ore., which has kept most of its employes busy for the past few months making necessary repairs, is also scheduled to reopen on a full-time basis at an early date.

## U. S. Gypsum Opens New Mississippi Board Mill

★ The new hard-board mill of the United States Gypsum Co., at Greenville, Miss., went into operation on Feb. 16. This mill, which is a part of the company's fibre insulation board plant at that location, produces a board said to be much harder than the ordinary type.

## Government Approves Universal Atlas Docks

The Universal Atlas Cement Co. has received permission from the war department to construct loading docks in the Mississippi River for the shipment of cement by water from its plant at Hannibal, Mo. Work will be started immediately on these docks in order to load cement for several lock and dam construction projects.

★ The Lone Star Construction Co. recently purchased a McLanahan & Stone 18-in. by 42-in. primary crusher for their limestone crushing plant at Kent, Tex.

# Dolomite Lime-Code Amendment Approved

### DIVISION OF LIME INDUSTRY

An amendment to the Code of Fair Competition for the lime industry, approved by Administrator Hugh S. Johnson of the National Recovery Administration on Feb. 10, 1934, brings the manufacture of dolomitic lime, or dolomite, for sale as a refractory within the scope of the lime-industry code. The amendment, which is known as Schedule B, follows:

SCHEDULE B—DOLOMITE DIVISION

Sec. 1. Within the meaning of this code, as amended by the addition of this Schedule B, the term "lime industry" not only has the meaning stated in Art. I, Sec. 1, but also includes the manufacture of dolomitic lime for sale as a refractory, irrespective of the extent of burning or of other refinements.

The manufacture of dolomitic lime (referred to herein as "dolomite") for sale as a refractory is hereinafter referred to as the dolomite division of the lime industry, which division shall constitute a self-governing branch of the lime industry.

The provisions of this code required by Sec. 7 (a) and 10 (b) of the act, and all other provisions of this code not otherwise specifically referred to and provided for in this schedule, shall apply with equal force within the dolomite division.

Sec. 2. The members of the dolomite division shall select a Dolomite Code Authority for the entire United States, consisting of one representative of each such manufacturer to administer the code, as amended by the addition of this Schedule B, within the dolomite division. Except as otherwise herein provided, the Code Authority, as the case may be, unless the conduties and powers in respect to the dolomite division which the District Control Committees have under the code in respect to their respective districts, and shall be subject to the same restrictions, limitations, and requirements. References in this code to the respective lime-industry districts or District Control Committees shall be construed as also referring to the dolomite division or to the Dolomite Code Authority, as the case may be, unless the context requires a different construction, except that the term "district," when applied to the dolomite division shall refer to the entire territory subject to this code.

The Dolomite Code Authority shall also exercise and perform in respect to the dolomite division the powers and duties which the Trade Relations Committee has in respect to the remainder of the lime industry under Art. III, Sec. 1; Art. III, Sec. 3, subdivisions (c) and (d); Art. IV, Sec. 2; and Art. V, Sec. 1 and 2 including the provisions contained in subdivision (b) of Sec. 2 of Art. V as to collecting reports and furnishing them to the Administrator.

The provisions of Art. III, Sec. 3, subdivision (b), as to weighted average costs, shall not apply to the dolomite division; nor shall the last sentence in subdivision (a) of Sec. 5 of Art. V, provided that appeal may be taken to the Administrator from the Dolomite Code Authority in the manner and in the respects specified in subdivision (c) of Sec. 5 of Art. V.

The representatives appointed by the Administrator to the Trade Relations Committee pursuant to Sec. 1 of Art. V shall *ipso facto* be appointed to the Dolomite Code Authority and, as representatives on the Dolomite Code Authority, shall have the same powers and duties in respect of the dolomite division as they have as representatives on the Trade Relations Committee in respect to the remainder of the lime industry.

For the purpose of facilitating the administration of this Code within the dolomite division in coöperation with the Administrator any member or representative of the Trade Relations Committee designated by it shall be nonvoting member of the Dolomite Code Authority. The Trade Relations Committee and the Dolomite Code Authority shall from time to time determine and agree upon the portion of the cost of the administration of this code to be borne by the dolomite division, which portion shall be apportioned among the manufacturers of dolomite as they may themselves agree.

Sec. 3. The Dolomite Code Authority may submit such recommendations as it deems desirable in regard to the control of destructive price competition in the dolomite division, and/or a proposed formula for determining a minimum cost below which no member shall be allowed to sell the products of such division. Upon approval of such recommendations or formula by the Administrator, after notice and hearing, such recommendations or formula shall become effective as part of this schedule and of this code.[1]

Sec. 4. The Dolomite Code Authority shall require all the present producers of dolomite within the continental United States to register with it their respective producing capacities of dolomite. The intention of persons engaged or engaging in the producing of dolomite to install additional producing capacity, shall be reported to the Dolomite Code Authority, and upon receiving such notice, the Dolomite Code Authority may make to the Administrator such recommendations in respect thereto as it may deem desirable to effectuate the purposes of the Act.

Sec. 5. The provisions of this code, as amended by the addition of this Schedule B, shall become effective within the dolomite division on the tenth day after the approval of this amendment pursuant to the Act.

[1] The order approving the amendment provides in part: " . . . that the provisions of Art. III, Sec. 3, subdivision C, insofar as they prescribe a waiting period, between the filing with the Code Authority and the effective date of revised price lists or revised terms and conditions of sale, be and they are hereby staged in their application to the Dolomite Division as created by this amendment pending my further order either within a period of 60 days from the effective date of this code or after the completion of a study of open-price associations now being conducted by the National Recovery Administration."

## Self-Unloading Cement Boat Under Construction

★ The self-unloading boat "Pacific Cedar" which has been purchased by the Santa Cruz Portland Cement Co. for bulk shipment of cement from its plant at Santa Cruz, Cal., is being converted into a self-unloader at Chester, Pa. When completed, about May 1, this boat will have a capacity of about 40,000 bbl. of cement and will be able to unload at the rate of about 2,000 bbl. per hour. This is said to be the first ship with its propelling machinery amidships to be so converted.

The Leathem D. Smith patented system of unloading is being installed. There will be four scraper tunnels for recovery of the cement from the hold, each tunnel having a Sauerman 4-cu. yd. Crescent scraper operated by an electric hoist of the same make. The scrapers in the two forward tunnels will deliver to a 10-in. Fuller-Kinyon pump located amidships. The scrapers in the after tunnels will deliver up an incline to a similar pump located over the propeller shaft tunnel. Westinghouse electric motors and equipment are being installed.

## Building Contracts Doubled in January

### 10 PER CENT. UNDER DECEMBER

Contracts let during January showed a gain of over 100 per cent. over January, 1933, according to F. W. Dodge Corp.; but the total of $187,463,700 was almost 10 per cent. smaller than the contract volume for December which totaled $207,209,500. The current January total was only 5 per cent. behind the volume for the entire first quarter of 1933; this discloses how great has been the relative improvement over the lethargic conditions of last year. In commenting on the outlook The Dodge Bulletin observes:

"There can be little doubt that the contract volume for the initial quarter of 1934 will exceed $500,000,000; this, in contrast with $196,000,000 for the corresponding quarter of 1933."

January contracts for residential building totaled $15,110,400 as against $23,899,600 for December and only $11,950,900 for January, 1933. Awards for non-residential building amounted to $58,616,100 in January as compared with $50,040,000 for December and only $28,731,600 for January of last year. Public works contracts (of engineering types) awarded in January not only exceeded the totals for both comparative periods but were more than 60 per cent. larger than those reported for the entire first quarter of 1933.

## Southwestern Adopts New Quarry Handling System

★ The Southwestern Portland Cement Co., Victorville, Cal., has revised its method of handling rock from the quarry to the plant. Instead of loading with the shovels direct to cars, necessitating the constant shifting of tracks, four large International dump trucks are now being loaded and these haul to a loading platform from which they discharge to the cars.

## NRA Dealers Only Will Get County Gravel Award

The Allen County, Ind., highway department recently held up the letting of contracts for gravel to be used on county highways to allow inspection of the gravel and to insure that the firms to which the contracts will be awarded are members of the N.R.A. County Attorney H. H. Hilgemann stated that under a recent ruling unless materials are bought from N.R.A. dealers there is danger that the county C.W.A. funds may be withdrawn.

★ The Dixie Lime Products Co., Ocala, Fla., plans rebuilding the burned portion of its hydrating plant at Zuber, Fla., which was recently damaged to the extent of about $20,000.

## Phosphate Production Gains Sharply in 1933

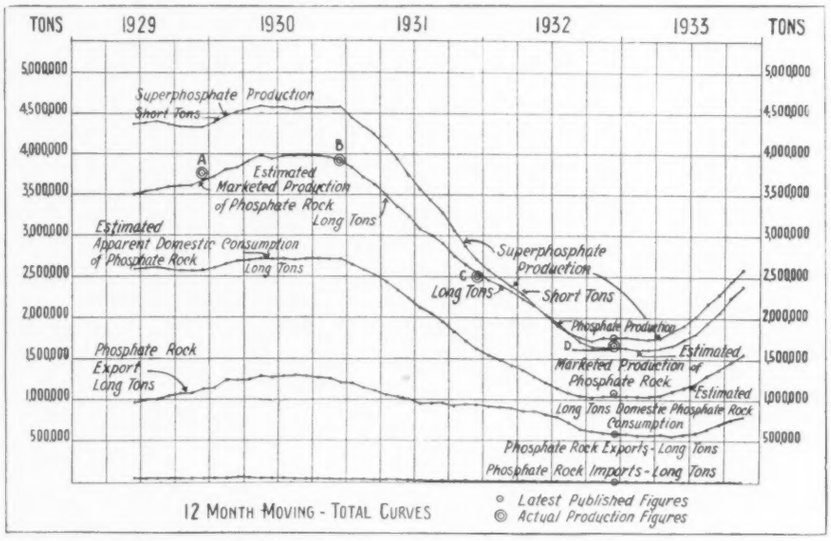
### ABOUT 43% OVER PREVIOUS YEAR

The United States Bureau of Mines compiles annual statistics of phosphate-rock production, but the figures are not available until several months after the close of the calendar year. Realizing the industry's need for closer contact with current trends, the bureau has considered various methods for furnishing prompt information with respect to monthly or quarterly outputs of phosphate rock, and, lacking funds for direct canvass, indirect methods have been devised to attain the desired results, says Bertrand L. Johnson of the bureau. Advantage was taken of the very close correlation between the annual domestic consumption of phosphate rock and the annual production of superphosphates, in the preparation of which the greater part of the phosphate rock is consumed. Monthly production figures for superphosphates are available about 45 days after the end of the month covered.

The accompanying chart shows the trend lines of superphosphate production and of domestic consumption and production of phosphate rock, as well as imports and exports of phosphate rock, expressed as 12-month moving-totals. Inasmuch as the figures plotted for a given month represent a total that includes the preceding 11 months, the curves indicate secular trends, with seasonal fluctuations eliminated.

The calendar-year figures obtained by this method of calculation for 1929 to 1932 check very closely with figures reported by the bureau as a result of its annual canvasses. Thus, in the chart the points *A*, *B*, *C*, and *D* represent the bureau totals of phosphate-rock production for the respective calendar years, and it may be observed that they are almost identical with the calculated points. It seems reasonable, therefore, to assume that the calculated continuation of the trend line for phosphate-rock production into 1933 as shown is approximately correct.

The production of phosphate rock for the 12-month period ending Nov. 30, 1933, is estimated at about 2,379,000 long tons, compared with 1,663,000 tons for the 12-month period ending Nov. 30, 1932, and 1,706,904 tons for the calendar year 1932. About 32 per cent. of the decline from the high points of 1930 had been recovered on Nov. 30, 1933.




Trends of phosphate-rock production and consumption and of superphosphate production.

## New Jersey Producer Builds Asphalt Plant

★ The Kingston Bituminous Products Co., Kingston, N. J., a subsidiary of the Kingston Trap Rock Co., has under construction a new asphalt plant which was designed by F. D. Cummer & Son Co., Cleveland, O. This plant will have a capacity of about 60 tons per hr. and will be in operation about March 15.

## Missouri Plant Destroyed by Fire Will Be Rebuilt

The No. 1 crushed stone plant of the Independent Gravel Co., at Carthage, Mo., was completely destroyed by fire on Feb. 2. The damage, estimated at $50,000.00, was partially covered by insurance. According to Ben D. Reynolds, president of the company, a new plant of about 400 tons per hr. capacity will be built to replace it. Orders will be filled temporarily by the No. 2 plant which was not damaged.

## California Cement Plant Has Good Safety Record

According to an announcement by the company the plant of the Calaveras Cement Co., San Andreas, Cal., has completed 3½ years of continuous operation without a lost-time accident. This record is said to be the best of any cement plant on the Pacific Coast.

## Pennsylvania Cement Workers Code Meeting

### MOVE TO PROMOTE ROAD WORK

Delegates representing the employees of cement mills in Dist. No. 1, under supervision of the Code of Fair Practice for the cement industry, met recently in Bath, Pa., to review the provisions for labor and to devise plans to assist cement mills in gaining a wider market for their products.

Thirty-five delegates from cement mills of Maryland, Eastern Pennsylvania and New Jersey exchanged information concerning the operation of the code in the various mills. Since the effective date of the code, most cement mills in this district have been closed, and it was agreed that the predictions of more employees being added to cement mill payrolls as a result of the operation of the code have not been fulfilled. It was also asserted that enough proof exists to justify the claim of employees that the former weekly earnings can not be maintained under the present code, and that more favorable changes are necessary.

The delegates decided to have all local unions of cement workers take an active part in the coming political campaigns with a view to electing governors, state and federal legislative officials, who recognize the value of concrete highways and who will support the building of such roads, thereby increasing the market for cement.

Further conferences will be held in various parts of district No. 1, and the delegates voted to make the district organization a permanent council to provide help and coöperation to the cement industry through the combined efforts of cement mill employees.

## Kentucky Rock Asphalt Elects Col. D. D. Thomson

Col. Dan D. Thomson was elected president of the Kentucky Rock Asphalt Co., Louisville, Ky., at a recent meeting of the board of directors of that company, succeeding W. H. Tarvin, resigned. Col. Thomson is a native of Louisville although of recent years he has been identified with the investment business and various utilities in Chicago. He also has a remarkable military record in the World War in which he served as a Lieutenant-Colonel and was awarded French and American decorations for distinguished service, including the Croix-de-Guerre with Palm, and was cited for the Distinguished Service Cross.

## First Cement Plant in Persia Now in Operation

The U. S. Dept. of Commerce reports further progress in Persia's industrialization program with the recent opening of that country's first cement plant. Reports state that the product meets the specifications of a medium-quality Portland cement. The plant cost $900,000 and has a capacity of about 100 metric tons daily.

# Editorials

## *Profits and the Cost of Recovery*

AN administration which came into power after decrying the heavy expenditures of the one it succeeded is being criticized because it has shown a capacity for spending at an even greater rate. During the remainder of the current fiscal year the public debt will rise $6,000,000,000 and in the following year the increase will be large enough to bring the total debt to some $31,000,000,000 or $32,000,000,000. The fact that this sum exceeds by roughly $5,000,000,000 the 1919 peak of $26,000,000,000 is seized upon by many as evidence of our inability to pay the bill when it becomes due despite the fact that the relationship between our present and expected indebtedness and that of the post-war period is of no significance whatever. Our ability to pay will be determined by our ability to earn and we have not yet discovered the limits of our capacity in that respect.

The government is borrowing huge sums of money and, for the time being at least, on favorable terms. This money is coming from the reserves of profits, either the profits of business or those of labor. Inasmuch as the rewards of labor are generally fixed by the profits of business, it may be said that all the money lent the government comes ultimately out of the difference by which business income exceeds business outgo. But, just as the borrowings will be traceable to business profits as the source, the expenditures will be traceable to business income as the destination.

In its plans for increasing the incomes of workers and farmers the government expects to increase the cost of labor and farm products. The greater incomes of both classes of people will be spent for the products of business which, in the absence of strict profit control by the government, will reap the profits needed to insure business recovery. At bottom the government's program is nothing short of a controlled redistribution of income. If this is considered as a fixed sum, which although an erroneous assumption is a common one, any increase in the incomes of farmers and workers would be obtainable only by effecting a corresponding decrease in the income (and the profits) of capital. As national income is not a fixed thing, there is no reason why the relationship between the income of labor and that of capital could not be changed without causing an absolute decrease in the profits of business. The rate of profit may be lowered without reducing the amount of profit. Increased consumption, the result of increased farmer and worker incomes, would furnish through greater production the expansion needed to offset reduced unit profit rates.

This is the way to recovery advocated by those economists who believe that depressions are largely caused by changes in the distribution of income among different classes of people, as the result of which purchasing power is decreased, if not absolutely at least relatively, and production and business earnings decline. Business develops rapidly in periods of prosperity, the income of capital increasing much more rapidly than that of labor. Surplus capital income finds its way into capital investment which further expands business activity and productive capacity. Owing to the fact that the income of labor has not increased commensurately, there is no market for the additional output of the more numerous and enlarged production facilities which surplus capital has provided, and business sags, the consuming population being unable to absorb the new and more numerous products offered to it. The depression continues until surplus stocks of commodities can be taken up and a reasonable demand for new production created.

As we have often pointed out, a restoration, or even only an improvement, of purchasing power offers the means of achieving business recovery. Higher wages for labor and higher prices for farm products affect immediately the purchasing power of the two largest sections of the population and, therefore, these have been the two chief points of attack in the government's plan for economic betterment. Higher prices for farm products must come principally out of the pockets of the workers who are the largest consumers of foods, and their incomes must, therefore, be increased, at least as rapidly as the food-price element of the cost of living. And higher wages must necessarily have their effect on business, either through increases in the prices of the commodities which business turns out or through decreases in the profit-rate obtainable from their production. Prices can be raised to absorb the burden of increased wages—and in many industries they have already been increased by amounts greater than necessitated by higher wages—but in some industries it is, of course, essential to consider the effects of competition and the checks placed on demand by higher prices. Even here, however, the competitive factor in pricing is being reduced or eliminated by code authorization of open-price policies and the forbidding of sales below reasonable or fixed levels, and the government has the power, through its representation on and supervision of various industrial code authorities, to prevent a general outrunning of wage increases by price increases.

All these conditions and remedies point unmistakably to an inevitable shrinkage of the profit rate and we think all prudent business men will accept the fact that it is inevitable and prepare to govern themselves accordingly. The profit motive is essential to the successful conduct of business because it is the underlying principle of the theory of busi-

ness enterprise, but the amount or rate of profit is not and never has been a fixed thing. To avoid extinction it is only necessary that a business should be able in the long run to keep its income above its outgo or, what amounts to the same thing in result, to keep its outgo below its income. A business that can not succeed in doing that is doomed.

The profit rate is not necessarily the determining factor in the survival power of a business. Most businesses continue on very slender profit margins, and many of the country's largest enterprises have been founded and conducted on that principle. Their great development has been due to the large demand which arose for their products, a demand which was increased by reasonable prices made possible by low profit rates. Some of them have been able to pay wages higher than the averages for their industries and so have added still further, through increased buying power, to the market for their products.

The government's plan is predicated on the theory that recovery can come only through increased purchasing power and that this end is worth attaining at any cost within our power to produce. If the pre-depression rate of profit is reduced, what remains will still be a gain when compared with the trials of a period of no profits. Profits will not be destroyed—not even through increasing taxes based on profits, since there will be no taxes if there are no profits; they probably will not even be seriously affected for long. Certainly there is no intention to eliminate the profit motive from business, because to do so would be equivalent to eradicating business itself.

The government's expenditures are being authorized and made for socially-useful purposes; they are being applied to constructive ends, the need of which is felt by the entire populace. The cost of the program, whatever it may be, as long as it is within the earning capacity of the people, will be paid, and with millions of men still unemployed there is no need to question our ability to earn what may be required.

## *The State of the Public Mind*

THERE probably never was a time within the memory of living men when the public's attention was so completely and continuously centered on the happenings at Washington. Scarcely a day passes without the arrival of some astonishing news from the nation's capital. One no sooner acquires a faint understanding of the latest move on the part of the administration than a new proposal, dealing with a different subject or attacking an old one from a different point of view, is brought before us. News from the seat of government certainly lacks nothing in interest or variety. It deals with the fundamental factors of social and economic life and merits all the attention given it by an eager and expectant public.

Bank moratorium, guaranteed bank deposits, government partnership in banking . . . public-works program, civic-works program, mass migration for unemployment relief . . . seizure of private gold, credit assistance for debtors, reduction of the gold content of the dollar . . . planning help for the farmer, the worker, the consumer and the business man . . . cancellation of air-mail contracts, exposure of huge executive salaries and bonuses, publication of income-tax returns . . . talk of government furniture-making and cement-making, control of communications over wires and through the air. . . . Small wonder that the average man cries, "What next?"

Yet we seem no better prepared for the latest news than we were for that of nearly a year ago. We are a well-schooled people but, it is to be feared, a poorly educated people. We see what goes on about us but apparently draw no conclusions from it. We discuss all these proposed activities of government, but our comments are those picked up from the newspapers. It is hard to find any evidence of individual, independent and sound thinking. Each new plan announced in Washington throws large sections of the population into temporary tantrums. As long as the subject occupies the front pages of the daily papers there is a stew of conversation, lamentations and dire forebodings. Excitement wanes, a new proposal wins the stage and the old one is quite forgotten. Meanwhile shock follows shock, prediction follows prediction, but none of the alarmists' forecasts become realities. A *resumé*, the psychologist will say, of the perfect behavior pattern of a dumb and dumbfounded citizenry, the great majority of whom do not, and can not, know "what it's all about."

As a people we have been experiencing a series of psychic shocks and we shall either crack under them or become inured to them. If we crack under them, we demonstrate our unfitness to survive what is in actuality nothing more than a mental revolution. If we surmount them, as we certainly shall, we may lay claim to all that basic soundness of mind and character of which we are wont to brag.

As a first step in an approach to sanity let us stop judging the merits and demands of new social and economic proposals on the basis of what at first appears to be their harmful effect on our pocketbooks. This habit—and it is a tenacious habit—is in no way reprehensible; it is merely short-sighted, the result of weighing everything on a profit-and-loss balance.

In addition to the social gains that will accrue from the changes we observe there is the mental reward of learning to think things through, and we are certain that this will be one of the great results of our present trials. Man learns slowly and painfully—even, we might say, in spite of a wall of resistance to new ideas which he unconsciously sets up—but he does learn some things ultimately. That being true, we see no cause for discouragement just because the public's mind still seems to be clouded by doubts and perplexed by misunderstandings. History has demonstrated man's *ability* to use his mind even though it may not present a flattering picture of his *willingness* to use it.

# Some Factors to Be Considered in the Selection of Power Shovels

## Capacity of Haulage Equipment Is Very Important in Determining Shovel Size

By DAVID W. EVANS

PRODUCERS and manufacturers of cement, crushed stone, gypsum, lime, sand and gravel, and other nonmetallic minerals almost without exception require one or more power shovels as part of their plant equipment. They know the shovel digs rock and loads it into trucks or cars. They know it requires certain routine maintenance, and that occasionally it will suffer a major breakdown. Eventually the machine must be replaced. What points must be considered in choosing the new machine? The average superintendent knows how to run his plant to attain the required volume of output at the lowest possible cost. But in view of the fact that his plant may not need a new shovel oftener than once every 10 yr. or so to replace worn-out or obsolete equipment, it is probable that some guide to a correct decision is welcome. Some factors entering into the proper selection of power shovels are presented herewith.

As a matter of convenience for the purpose of this article, the work done by excavating machinery may be placed in three classifications: Digging blasted rock for crushed-stone plants, lime kilns or cement mills; digging sand and gravel; and such relatively minor excavation as stripping and clay production. There is, in addition, the important work of rehandling the finished material to and from storage, which is not strictly referred to as excavation, but requires similar equipment. There are also a few instances where "tunnel" shovels are used in underground quarries, but no discussion will be made of these exceptional cases.

One matter to be decided is just when a shovel should be replaced. Even if it is still in good condition, a machine 10 or 15 yr. old may be far more expensive to operate than a modern one. Modern power shovels embody many refinements in design, such as the change from the use of a riveted, structural design to rugged, single-piece steel castings for the main frame and base. In some cases even these steel castings are improved upon by the use of a welded-steel frame, which is less likely to have hidden faults than a casting, so that adequate strength is furnished with less weight. Larger drums and sheaves have materially improved the life of wire ropes, which constitute a large proportion of upkeep cost. Another improvement has been the substitution of bronze or anti-friction bearings for the babbitt-lined journal. Gears and chains operating at high speed are inclosed and run in oil. In general, the modern machine is faster, stronger, and more economical, both in power consumption and in the repair cost per cubic yard, than the old.

*Shovel-Size.*—One of the first points to be considered is the size of the shovel required. If the plant is a new one, this is relatively a simple matter, because other factors affecting shovel capacity can be adjusted on paper. But in most cases conditions in an existing plant must be faced. Generally speaking, a single power shovel of a size adequate to supply capacity tonnage to the plant is the ideal selection. With this, only one shovel crew is required, and only one hauling system. However, the quarry lay-out may not be suitable. The deposit of rock or gravel may occur in pockets. Instead of a single, long quarry face, there may be a number of faces, no one of which could be worked to insure sufficient production. Unless the expense of changing the quarry lay-out can be justified, it is better under these conditions to figure on two or more smaller shovels.

Sometimes hauling equipment will affect shovel size. Suppose a plant has two 1½-cu. yd. railroad-type steam shovels loading into trains of 4-cu. yd. dump cars hauled by "dinkies." One modern 3-cu. yd. shovel has the capacity to load more stone than these two machines, but not in 4-cu. yd. cars, because while 3 of the small dippers will fill these cars, they are too small for two 3-cu. yd. dipper-loads. Where the haul requires trains of 6 or 8 cars, the investment required for larger cars to suit the larger shovel is a sizable item. Under these conditions the most economical plan might be to buy two modern 1¼- or 1½-cu. yd. machines, which would be suited to existing hauling units.

Often the size of the primary crusher is a governing factor. Many quarry men insist that the shovel dipper be small enough so that a rock passing through it will also pass through the crusher. A good shovel operator can cast aside oversize rock without appreciable delay, so this should not be an important point unless the difference between the dipper size and the crusher size is too great. A 2½-cu. yd. rock dipper with an opening 54-in. by 54-in. in size can be used successfully in loading stone bound for a 42-in. by 48-in. jaw crusher.

Whether one shovel or more than one is decided upon, the total shovel capacity should at least equal the plant capacity. It will be found that for a given dipper capacity the price of one shovel will roughly equal the total price of several smaller machines. However, one 2-cu. yd. shovel will produce more tons of blasted rock per day than two 1-cu. yd. shovels. No matter how well the rock is blasted, the bail pull required to force the dipper into the bank is far higher than might be expected from the weight

| Dipper Capacity (*cu. yd.*) | Digging Cycle (*sec.*) | Theoretical Output (*cu. yd.*) | Actual Output (*cu. yd.*) |
|---|---|---|---|
| ¼ | 15 | 600 | 150 |
| ½ | 15 | 1,200 | 300 |
| ¾ | 15 | 1,800 | 450 |
| 1 | 16 | 2,250 | 600 |
| 1¼ | 17 | 2,650 | 800 |
| 1½ | 18 | 3,000 | 1,000 |
| 2 | 19 | 3,800 | 1,400 |
| 2½ | 20 | 4,500 | 1,900 |
| 3 | 22 | 4,900 | 2,200 |
| 4 | 22 | 6,500 | 2,900 |
| 5 | 25 | 7,200 | 3,600 |

per cubic yard of the material. The larger shovel has so much more power than the smaller that its dipper will not be slowed up so much while filling. In digging gravel, unless cemented, this advantage is less marked because of the easier digging, so that the two small machines may actually produce more than the large one.

The output which may be expected from a power shovel of a given size is a matter which must be approached with caution. Through engine speeds and gear ratios a theoretical capacity can be arrived at. But the percentage of this capacity which represents average actual output in rock or gravel is dependent on so many conditions that shovel manufacturers will never guarantee any output unless it is far below a reasonable expectation. The accompanying table, while it can not be taken as reliable on account of the wide variation in operating conditions, indicates approximate shovel outputs, under average quarry conditions, during a 10-hr. day.

While individual plants will secure shovel outputs higher or lower than these figures, depending on how hard the digging is, how well the rock is shot, and how efficiently the hauling system functions, these yardages are representative for digging well-blasted rock. For sand and gravel, unless cemented, and for clay outputs will run around 20 to 25 per cent. higher. Where a drag-line is used, manufacturers ordinarily figure 40 per cent. less output in easy digging, and 55 per cent. to 65 per cent. less in rock. The drag-line has a slower digging cycle than the shovel. The principal delay is in the swing, which is slower because of the inertia effect of the long boom. In addition, in filling the drag-line bucket more time is involved because of the greater distance through which the bucket is pulled. Inasmuch as a drag-line would never be chosen for quarry digging, drag-line outputs can be calculated at 75 per cent. of the above figures. However, in such cases as those in which drag-lines are used on quarry stripping a lower output is assumed, because usually on this class of work the excavation is so sketchy that small yardages will be produced. The crane with a clam-shell bucket, used in most cases on storage rehandling, will handle usually 50 to 60 per cent. as much output as the same size of shovel in easy digging. The capacity of such machines can therefore be figured at about 70 per cent. of the above figures.

*Types of Shovels.*—It can be stated definitely that the largest shovel widely used in the crushed-stone industry is of 5-cu. yd. capacity. From this maximum the sizes range down to ¼ cu. yd. The machines available to-day can be grouped as "large" or "small," with the first group including those from the 2-cu. yd. size up.

Power shovels are built especially for their major use. The large machines are of two types, namely, stripping shovels and quarry shovels. The former may in isolated cases work out to the best advantage in sand-and-gravel plants. The latter, as their name implies, are built particularly for rock work. As contrasted to the strippers, they are close-coupled, fast machines of the most rugged construction. These shovels have low repair expense, far less per cubic yard than that of the "small" machines.

Below the 2-cu. yd. size most power shovels are built primarily for construction work. In proportion to dipper size their weight is less, and they have higher working speeds. While neither of these characteristics is essential for rock work, both are as advantageous in sand and gravel or clay as on earth excavation. It is therefore apparent that these "small" shovels will have higher maintenance per cubic yard on heavy work, a fact which must be considered in a study of single- or multiple-shovel operation. On this account, better costs will be obtained in rock with a shovel of larger than the required capacity, because of the greater freedom from breakdowns. For example, in selecting a shovel to dig blasted rock for a plant of 400-cu. yd. (or about 550-ton) capacity, a ¾-cu. yd. shovel will handle the required tonnage. But steadier production and lower cost per cubic yard will be obtained from a 1-cu. yd. or 1¼-cu. yd. machine. The higher

Fig. 1. The railroad-type steam shovel with crawler mounting which is still used in many quarries.

Fig. 2. A typical rugged, modern full-revolving electric quarry shovel shown loading large cars.

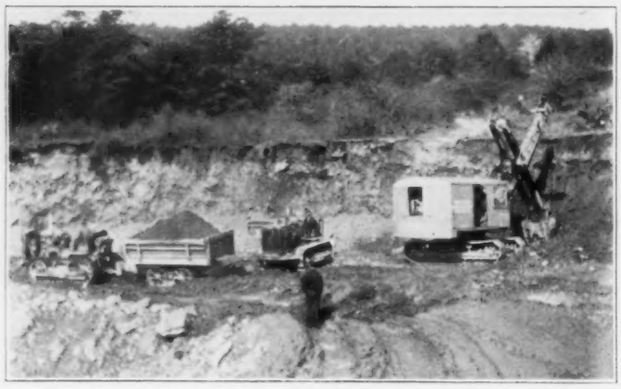


Fig. 3. A gasoline-powered shovel of the type best suited for stripping and pit work because of its independence from a power source.

Fig. 4. A typical Diesel shovel which is well suited to rock digging because of the high torque of its engine when running at slow speeds.

initial investment and higher fuel consumption are more than offset by the lower repair cost during the life of the machine, especially as the larger machine will last longer. (In this small-machine group it must be noted that some manufacturers offer a 3-motor electric shovel which shows better economy on repairs than the light shovel driven by one motor or by an internal-combustion engine.)

Drag-lines (Fig. 5) have a distinct field in the sand-and-gravel industry and for stripping in stone quarries and similar work. The term is applied to an excavator equipped with a long boom, and a bucket which is filled by being pulled toward the machine. (Drag-lines should not be confused with slack-line cableway excavators, sometimes also called drag-lines.) The drag-line proper is not suitable for rock work. A thrust powerful enough to force the dipper into the rock is required, and the weight and digging angle of the drag-line bucket are insufficient to provide this. The advantages of the drag-line over the shovel are its greater reach, and the fact that it can dig below its own level. Where material is suitable, as in the case of sand and gravel, the drag-line sometimes works to better advantage than the shovel, because the greater initial cost for the required output is more than offset by the possible simplification of hauling. Drag-lines are ideal for gravel plants where the deposits are below the water-level. As an example of drag-line application, it may be mentioned that all the aggregates for the world's largest gravel plant at Boulder Dam have been excavated by a drag-line.

While the railroad-type shovel (Fig. 1) is no longer manufactured, many of these old "standards" are still producing daily in plants throughout the country. A comparison with modern quarry shovels demonstrates that the savings obtainable with new equipment justify replacing the old machines. Maximum savings occur in cases in which the "standard" shovel mounted on railroad trucks is displaced. Delays from the arduous frequent moves necessary with these machines are eliminated by use of the modern types and there is a reduction of from 4 to 6 men in the size of the shovel crew. Even when the "standard" shovel is equipped with a crawler mounting, the modern quarry shovel shows impressive economies. Where the shovel loads cars, the greater working range of the full-revolving machine cuts loading-track moving costs by one-third. The ability of the modern machine to cast oversize behind it for secondary drilling saves many precious hours. These savings are in addition to the lower operating and repair expense already mentioned.

*Types of Power.*—Shovels and drag-lines are available with a choice of steam, electric, gasoline, or Diesel power. In addition are offered gasoline-electric, Diesel-electric, and gas-air machines. Each type of power has certain advantages.

The first steam shovel was built prior to 1850, and with rare exceptions steam was used for power on all shovels built up to 1910, since which time the other types of power have rendered the use of steam practically obsolete on shovels. A steam-engine has a unique advantage for shovel power. If the shovel dipper is thrust into a rock bank so hard as to stall it, full hoisting pressure is still exerted on the dipper. This feature makes possible smoother operation, with less strain on the working parts of the machine. However, there are several disadvantages. There is high maintenance expense on the boiler, due partly to water troubles, but mainly to the effect of constant jarring. There is the expense of firing up, and a constant stand-by loss in maintaining steam when the shovel is temporarily shut down. It is costly to supply water and fuel to the shovel. And other types of power cost less than the coal, wood or oil required for the generation of steam.

Electric shovels (Fig. 2) are probably being more widely sold in the stone and gravel industries than any other type of large-size machines. These are equipped with separate electric motors for the three shovel motions of hoisting, swinging and crowding and these are especially designed for shovel service. Direct current is supplied to these motors through a motor-generator set provided with exciters equipped with Ward-Leonard control. The digging characteristics of these modern quarry shovels approximate steam performance for smoothness. In addition to lower power cost, such features as regenerative braking have made electric shovels so much cheaper than steam shovels as to render the

latter type of power obsolete. The feature of this control is that it affects the low currents in the motor fields, which can be done far cheaper than by the use of resistances in series with the armatures. This type of control was used on earlier electric shovels, and is employed on the "compromise" electric shovels offered in the smaller sizes. However, while Ward-Leonard control makes for maximum economy in these large shovels, its initial cost makes its use unusual on the small machines.

The highly-developed gasoline-powered highway contractor's shovel is often offered for quarry use with an electric motor substituted for the gasoline engine. There is usually some saving in electric power as compared with that of gasoline power, but unless this power can be brought to the shovel cheaply, there is little choice. The gasoline-powered shovel's fundamental disadvantage, which is brought out later, applies equally to these one-motor electric machines. They will handle sand and gravel satisfactorily, and they will dig rock. But the repair expense will be higher than with a shovel having independent power on the three digging motions.

The first steam shovels used single engines from which power was taken through friction clutches for hoisting, swinging and crowding. A big step forward was the change to three independent engines, which have been used down to the present time. The gasoline-engine shovel (Fig. 3), which has come into prominence since 1920, has only one power plant, so it reverts to the use of the friction-clutch transmission. These clutches are subject to rapid wear, and require frequent replacement, especially in rock excavation.

The power available on a shovel for hoisting, known as bail pull, is established more or less uniformly for the various sizes of shovels. Especially in rock, one encounters the digging condition where the power required to force the dipper up is greater than the bail pull. Under these conditions the steam or electric machine still delivers full bail pull to the dipper, and the thrusting motor or engine can pull the dipper back until the hoist can again raise the dipper. On the gasoline-powered machine the hoist is directly connected to the engine through friction clutches. If the dipper is stalled, the engine will be stalled or the clutch will slip. As the engine slows down there is not sufficient power left to pull the dipper out of the bank. This is the fundamental disadvantage of the gasoline shovel in rock work, although a skilled operator can overcome it to a great degree. This objection is of much less importance in lighter work. This has been overcome to some extent by the use of larger engines, more powerful crowding mechanism, and heavier clutches.

It is not to be inferred that the gasoline-powered shovel is not good. On the contrary, it is far cheaper to operate under normal conditions than the steam machine, and, because of its independence from a power source, is more convenient than the electric machine. Gasoline-powered shovels are available in sizes up to 3 cu. yd., but the cost of operating those larger than 1½ cu. yd. makes them far more costly than the electric shovels available. In the smaller sizes the convenience of gasoline power must be weighed against the cost of electric power. Electricity may cost less, but the added expense of transformers and power lines may swing the scales in favor of gasoline power. The range of operations of an electric shovel is limited by the length of its power cable. This in turn is limited by the voltage drop occurring between the transformer and the shovel. Where the same machine loads rock during the season and handles stripping of overburden during the off-season, or even takes care of rehandling storage, the ability of the gasoline or Diesel-powered shovel to move wherever required is certainly an important point in its favor.

Diesel-powered shovels (Fig. 4) are in every respect the same as gasoline machines except for the engine. The fuel used costs from 25 to 40 per cent. as much as gasoline. This saving offsets the higher initial cost of Diesel power, usually in 3 yr. In addition, because of its slower speed, the Diesel engine has a longer life. Another advantage of the Diesel engine in rock digging is its "lugging" ability. The pull on the hoist rope is maintained at lower proportional speeds than with a gasoline engine. So the Diesel shovel digs better in rock than the corresponding gasoline machine.

The gasoline-electric shovel combines the convenience of gasoline with the better digging characteristics of the electric. Because of the complicated controls there seems some question as to its relative operating cost, but apparently it runs about the same as that of the straight gasoline machine and somewhat more than that of the straight electric. This power is available only in the smaller sizes. Diesel-electric power may similarly be classed as higher in first cost, lower in operating cost, with the independence of gasoline from a power source, and the better electric power.

The gas-air shovel, with air-operated engines for swinging and crowding, approaches the steam ideal for power in rock digging. This machine requires a better operator than the straight gasoline shovel, but will produce higher outputs in rock digging at the same cost.

From the foregoing discussion it is seen that in the sizes up to 2 cu. yd., which are selected for the majority of quarries and gravel plants, the electric-powered machine has the better digging characteristics, against which must be weighed the convenience of gasoline or Diesel power. In the larger sizes the electric shovel is the only choice for consistent output with low power cost and low maintenance expense.

In the selection of a machine which will be used not only for rock or gravel production, but for stripping and stock-piling, the shovel should be chosen for its major use which, as it happens, is also its severest service. However, where such movement of the machine is contemplated, the convenience of gasoline or Diesel power must be considered.

*Rehandling Machines.*—The rehandling of the finished product to and from storage is an added expense which must be kept at the minimum. Except for the fortunate plant which can ship its output immediately, this expense is an important item

of plant operation. If the investment can be justified, the lowest cost of handling stored material is secured by placing it in elevated bins, or silos. Still another method is the construction of tunnels, with conveyor belts beneath and above the storage-piles. The initial cost of such methods, however, is too high for most plants. The best method, therefore, is to store the finished product in piles, using a crane equipped with a clam-shell bucket. In some cases a shovel may be used, but the greater reach of the clam-shell machine recommends it for this work.

Rehandling cranes are of two types; the locomotive crane running on rails, and the crawler crane, running on its own belts. Use of the locomotive crane is, of course, confined to locations where track is laid for it, whereas the crawler crane can go anywhere. At the same time, the locomotive crane can be used for shunting and "spotting" cars, and can move from place to place much faster than the crawler crane. Where an extensive area of stock-piles must be served, the high traveling speed of the locomotive crane makes prompt service possible, where delays might occur with the crawler crane. Besides, its ability to move cars saves investment in a locomotive when cars must be "spotted."

Most locomotive cranes are built especially for the work, while the crawler crane is a modified shovel. There is no choice on this point, however, as the latter with suitable drum lagging is equivalent in capacity to the former. The average plant requires a crane with a ¾- to 1¼-cu. yd. bucket, capable of handling from 350 to 550 cu. yd. per day.

The locomotive crane is offered with a choice of steam and gasoline or Diesel power. Diesel power is cheaper than gasoline, which more than offsets the higher initial cost. These two types of power have been introduced on the locomotive crane within the last five years, and their application to date has been so limited that a comparison with steam is difficult. While the steam-powered locomotive crane has somewhat better basic characteristics, it seems logical to assume that gasoline- or Diesel-engine power will prove as much better than steam on locomotive cranes as it has on the crawler cranes.

While the length of the boom on locomotive cranes is well standardized for the bucket size, crawler cranes differ considerably in this respect. The locomotive crane, for the same weight, has less stability than the crawler crane, due to its relatively narrow tracks. Crawler cranes, for the same size, vary considerably in weight, and the distribution of this weight also varies, affecting the crane rating. Thus it will be found that some crawler machines, basically of the ¾-cu. yd. size, can be equipped with a longer boom carrying the ¾-cu. yd. bucket than the more expensive 1-cu. yd. machines. As clam-shell service is relatively easy work, the well-designed ¾-cu. yd. machine should serve the purpose. The length of boom required is usually 40 to 50 ft., depending on the bins to be served and the size of the stock-piles required.

*Types of Design.*—With the size and number of shovels required determined and with a choice made as to the power best suited to plant and quarry conditions, a decision must still be reached in choosing the individual make of the machine. The producer wants the one that will, during the next few years, load stone at the lowest unit cost. Every shovel builder feels he is offering this particular machine.

The functions of a power shovel in loading rock consist of hoisting the dipper, thrusting the dipper into the bank, and, after it is loaded, swinging the dipper around to dump its load into the waiting truck or car. The process is repeated over and over, all day long. The shovel which can repeat this process most often is the one which will produce the largest output. This is not accomplished merely by speed, or by power, or by weight. The biggest tonnage is put out by the machine with the best-balanced design.

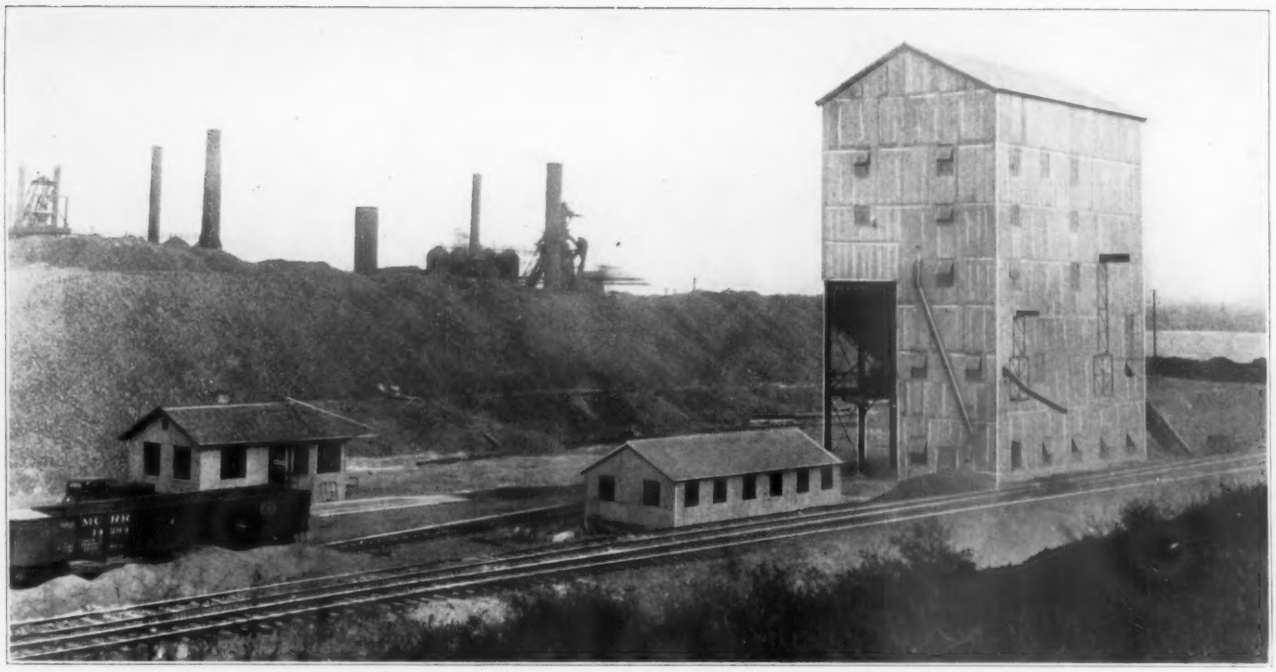
The weight of a shovel is no indication of its digging ability. In fact, the lighter it can

(*Continued on page 40*)

Fig. 5. A walking drag-line which is well suited for use in many gravel pits.

Fig. 6. A small shovel with the type of inside dipper stick discussed by the author.

Fig. 7. A shovel with the outside dipper sticks mentioned in this article.



The slag plant of the Great Lakes Steel Corp. near Detroit, Mich. Raw-material track hopper is at extreme right, office and scale building at left and tool and parts storage building in foreground. The company's two blast-furnaces are partly visible in background.

# New Slag Plant Well Located To Serve the Detroit Metropolitan Area

## Flexibility of Sizing Attained Without Sacrificing Simplicity

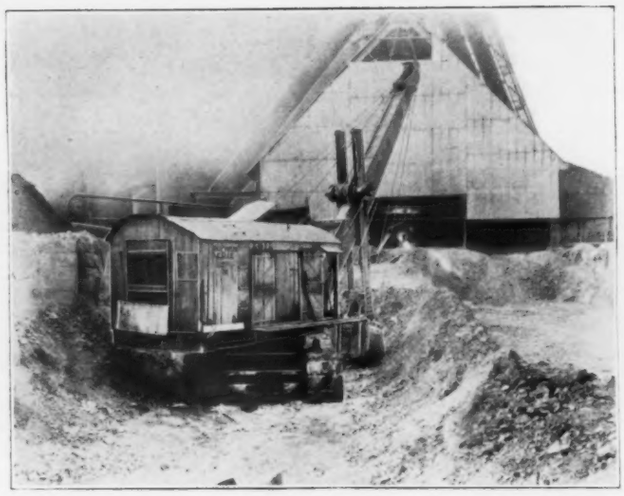
By W. E. TRAUFFER

THE new slag-crushing-and-screening plant of the Great Lakes Steel Corp., a division of the National Steel Corp., is located at Zug Island, only 5 mi. from downtown Detroit. With one exception it is the only plant producing concrete aggregates within the city limits and its strategic location allows the making of short direct hauls to local building-construction jobs with minimum transportation and handling charges. Because of this condition, ease of truck loading was one of the important considerations in the design and location of the plant. Its location on principal main railroads and connecting belt-lines also facilitates railway deliveries and the fact that it is at the juncture of River Rouge and Detroit River, adjacent to the extensive docks of the steel corporation, allows economical and speedy loading of boats for shipments over the Great Lakes.

Large-scale production of steel products has become a reality in the Detroit area only within the past three years. This increase in steel production was brought about by the building of the Great Lakes Steel Corp. plant, which went into operation in 1930. Prior to that time the steel industry in Detroit was small, and the resultant production of slag was correspondingly small. Slag was little used as a Class "A" aggregate. The Great Lakes company soon realized the fact that slag, to be used as it is in the steel-producing areas of Pennsylvania, Ohio, Illinois, Indiana, Alabama and other states, necessitated, first, quality production, and, secondly, active marketing and education. Accordingly, in 1933 the company initiated a program to have slag included in state and municipal concrete specifications and then to build a plant that would produce a product to meet these specifications with the maximum efficiency and economy. This program is almost completed.

Office building and scale house with empty truck and trailers being weighed before loading. Note slag piles and blast furnace stack visible in background.

The resulting plant, which has a capacity of 100 tons per hr., went into operation late in November, 1933. Sim-

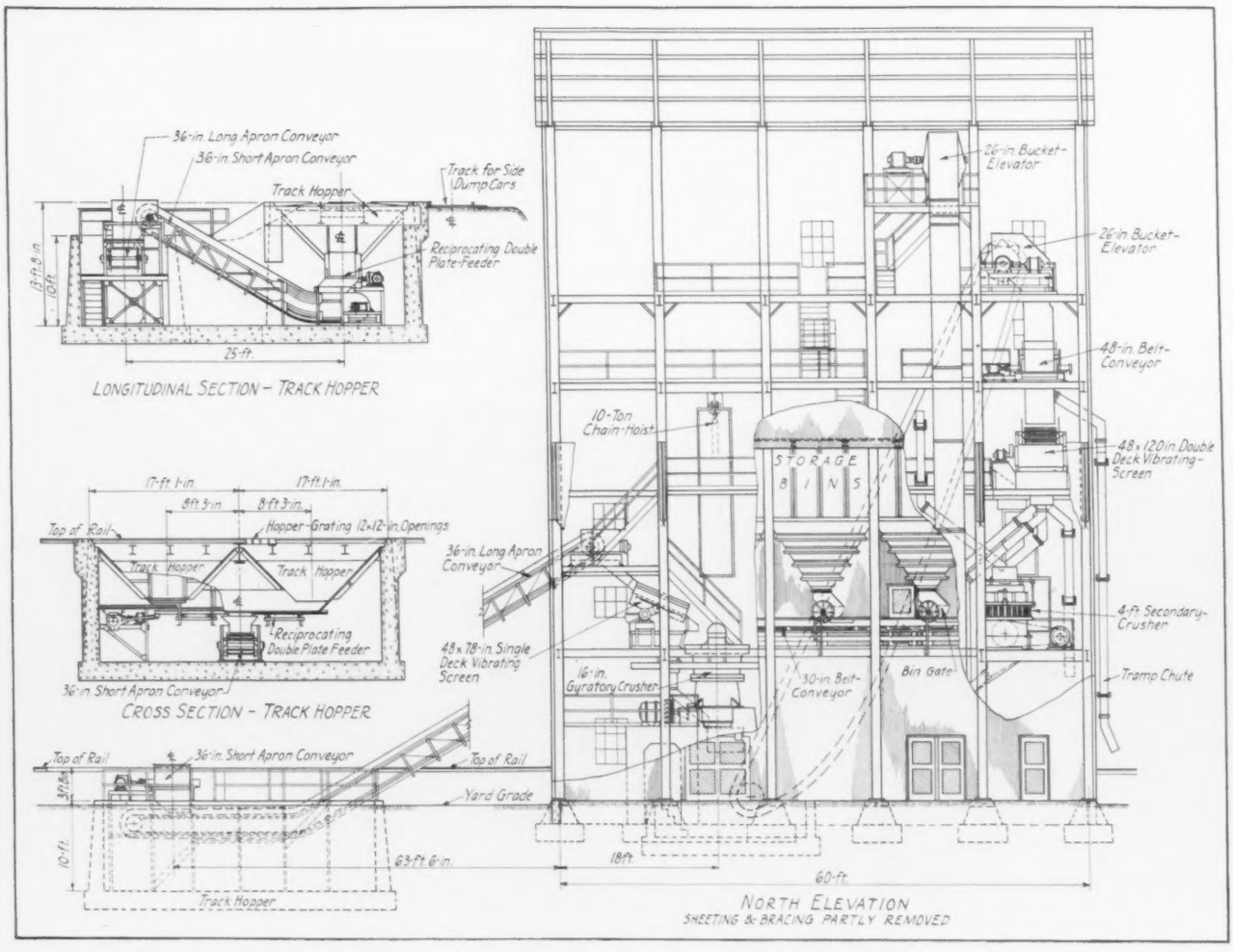


Shovel excavating slag from one of pits at "B" furnace. In background molten slag is seen flowing from blast-furance into pit.

Hopper-bottom car over track-hopper which discharges to series of pan conveyors feeding plant. Drive of short conveyor at left.

plicity is the keynote in its design. It was planned and constructed under the supervision of the company's engineering department headed by J. A. Clauss, chief engineer, and was erected by its own mechanical and electrical forces. Several of the major equipment companies also contributed to and were consulted in its design. It is entirely of concrete-and-steel construction and was made unusually flexible in its design to meet the widely-varying specifications prevailing in the territory it serves. The crushing-and-screening building, which also incorporates the storage-bins, is 60 ft. long, 38 ft. wide and 75 ft. high and is enclosed with corrugated-steel siding and roofing.

Conveniently located in its relation to the blast-furnaces on Zug Island, the slag plant is serviced



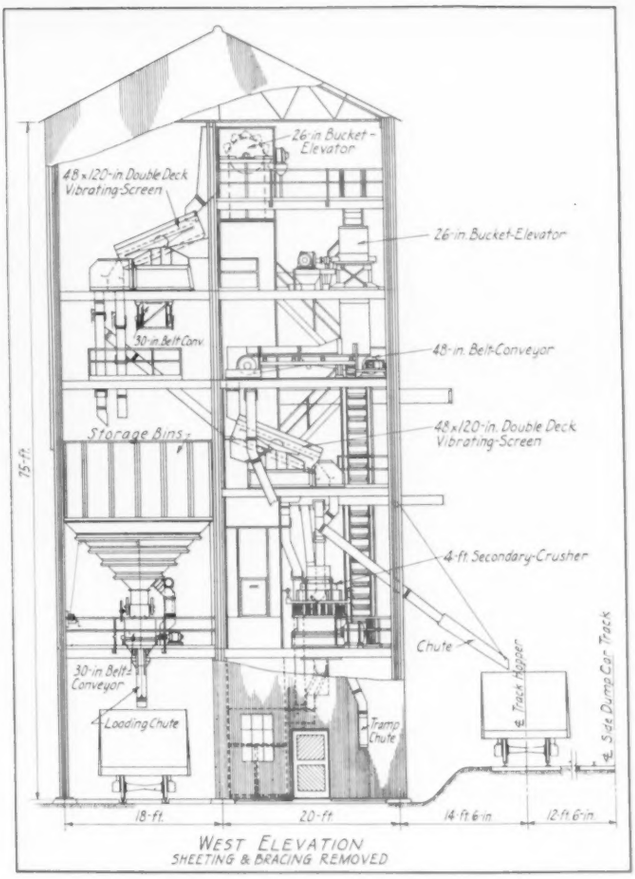

Drawings showing lay-out of equipment in the track-hopper and in the main plant building.

by a complete system of company-owned railroad tracks that allow easy handling of the raw material and finished product. A system of roadways for truck shipments is incorporated in the layout of the plant.

Slag for this plant is obtained from the two blast-furnaces operated by the company on Zug Island. These have a capacity of 500 tons daily. Each furnace has two pits of 1,000-ton capacity each which are used alternately. Ordinarily each pit is cleaned out about once a week. No water is used to cool the slag in the pits until it has naturally cooled to a sufficiently low temperature. The slag is solidified when it is brought to the plant. When ready for processing, it is a comparatively-dense material and in a graded concrete mixture will average about 80 lb. per cu. ft. At present about 150,000 tons of high-grade slag is in piles near the plant and this can also be used.

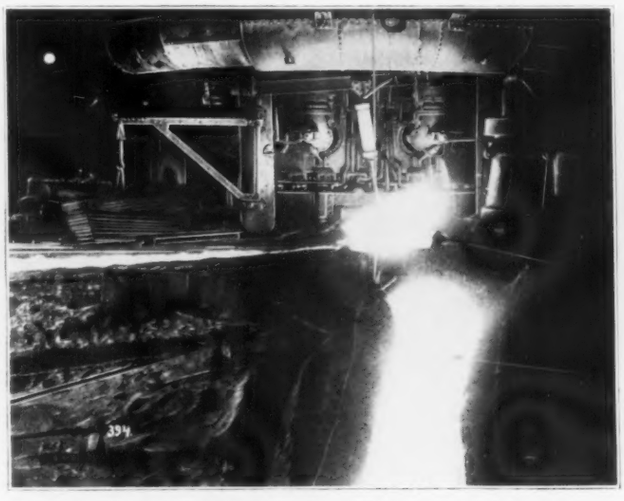
Slag is picked up from the pits by a Bucyrus-Erie 1½-cu. yd. Diesel-engine shovel and is loaded into 30-cu. yd. Differential and Western side dump cars for transportation to the slag-crushing plant, a distance of about 1,500 ft. The track-hopper is arranged to receive slag from standard hopper cars, too. Steam locomotives are used. At the crushing plant the cars are "spotted" over a 45-ton capacity steel-and-concrete track-hopper, which is 32 ft. long and 14 ft. wide. It is of the double type, with high-carbon-steel wearing plates, and is equipped with a bar grating having 12-in. by 12-in. openings. This grating allows the distinguishing of any large pieces of slag from iron before they are hand-sledged into the hopper below.

A 36-in. Jeffrey reciprocating-plate feeder, equipped with high-carbon-steel wearing plates and located under the hopper, is driven through an adjustable-stroke eccentric and is arranged to discharge the material from both sides to a 36-in. Jeffrey inclined apron cross conveyor. After leaving the cross conveyor the material is delivered to the horizontal run of another 36-in. Jeffrey apron conveyor, at which point an attendant picks out the large pieces of iron from the slag. Passing along the horizontal run of this conveyer, the material is then elevated to the crushing-and-screening building.

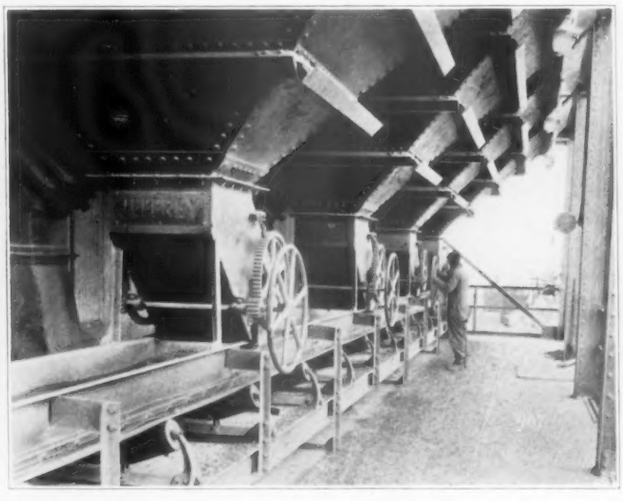



**Drawing showing arrangement for loading finished material at left. Arrangement for direct loading of large sizes into cars at right.**

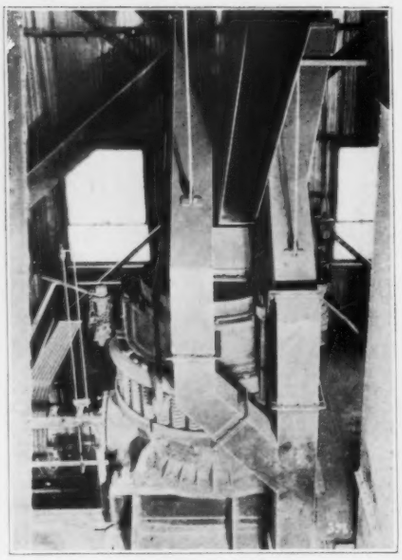
After being discharged to the 48-in. by 78-in. Robins Gyrex primary scalping vibrating screen the oversize material passes into the 16-in. Traylor Bulldog primary crusher, while the material passing through the screen joins the crusher's discharge in the receiving hopper of a 26-in. inclined continuous-bucket elevator. The buckets of this elevator are mounted on a 30-in. wide, 10-ply, rubber-covered belt. A 40-in. belt-conveyor, with a 24-in. di-



**Close view of one of blast-furnaces showing molten pig iron and slag being discharged.**



**Plant storage-bins and gates controlling discharge to mixing-and-loading belt-conveyor.**



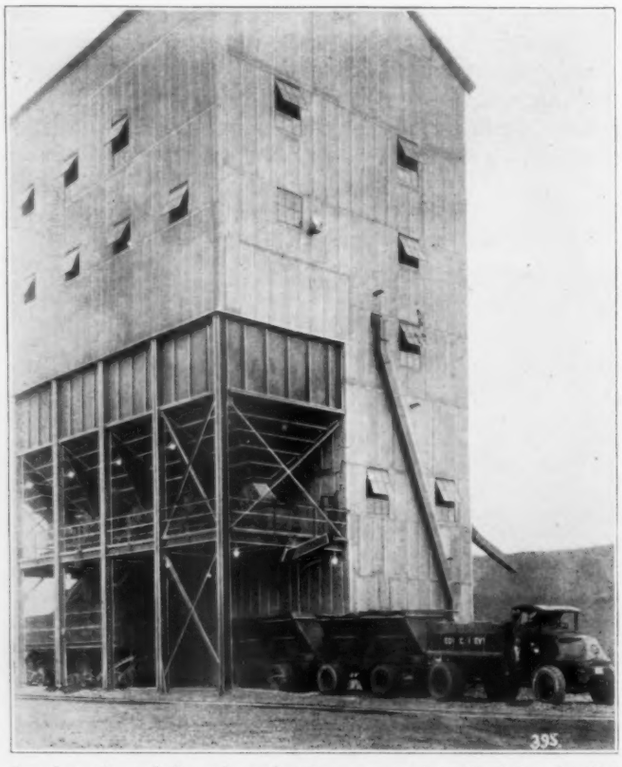
The cone secondary crusher with feed chute and chutes from secondary scalping screen by-passing crusher to elevator.

The 60,000-lb. capacity springless-dial truck scale with automatic gross and tare weight recorder at right.

Employee wearing respirator shown at electrical master-control board from which most of machinery is visible.

ameter by 50-in. wide Cutler-Hammer magnetic separator head pulley, receives the slag from the elevator. This pulley separates the small pieces of iron from the slag and sends them by a chute out of the building, where they are discharged into a car and returned to the furnaces.

The slag is then discharged upon a 48-in. by 120-in. Robins Gyrex double-deck scalping screen. Normally this screen will be used as a single-deck screen but when producing large sizes, such as railroad ballast, the top deck can be used also, thus allowing the material passed through the top deck and retained on the lower deck to be chuted direct out of the building into railroad cars for shipment. However, when the bottom deck alone is used, the oversize material is delivered to a 4-ft. Symons cone crusher, while the material passed by the screen is chuted to the receiving hopper of a 26-ft. vertical continuous-bucket elevator, joining at that point the product of the cone crusher. The buckets of this elevator are mounted on a 30-in. wide, 10-ply, rubber-covered belt. A steel casing, built up in sections, incloses the elevator, the head section of which is provided with a discharge chute for delivering the material to the top deck of the 48-in. by 120-in. Robins Gyrex first finishing screen.



Another view of slag plant showing cars and trucks being loaded. Chutes for metal and direct loading of large sizes are at right.

This screen is located over a system of five storage-bins, and the sized material from the top and bottom decks is conveyed by means of chutes into No. I and No. II storage-bins respectively. Provision has also been made whereby the material from the top and bottom decks can be returned to the 4-ft. crusher for recrushing. The material passing through the bottom deck goes to a 30-in. inclined belt-conveyor which delivers the material to the top deck of the second Robins Gyrex finishing screen, which is the same size as the first. The material from this deck is chuted into the No. V storage-bin, while the sized material and the "fines" from the bottom deck are chuted into No. IV and No. III storage-bins respectively, thus completing the grading operation.

Each of the five storage-bins has a capacity of 100 tons. Located beneath these bins is a 30-in. mixing belt-conveyor. An arc-type bin gate on the bottom of each of the storage-bins feeds this mixing conveyor, making possible the proportioning of two or more sizes to produce any desired mixture. Each gate is operated by a hand-wheel through a gear and pinion. At the discharge end of the conveyor is a loading chute which can be lowered by means of a hand winch into the cars or trucks below as a means of preventing further breakage of the material during loading. A second gate, located on each of the storage-bins, can be used to by-pass the

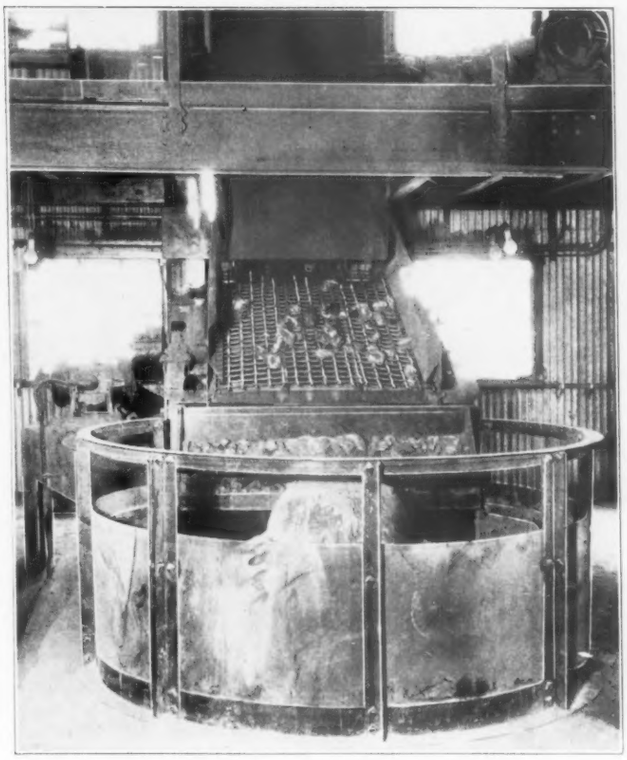
mixing conveyor so that the cars or trucks can be loaded through spouts with straight sizes direct from each storage-bin. These gates are chain-operated from the ground.

A Fairbanks 40,000-lb. capacity springless dial truck-scale has been provided to assure the correct weighing of all material shipped. This scale has an electrical-mechanical recorder which records gross and tare weights. The capacity of the scale can be increased another 20,000 lb. by means of 2 weight beams. The scale is housed in a 1-story brick building located near the slag plant and convenient to the main road leaving the plant. This building also houses the plant offices and is equipped with air-conditioning and heating apparatus which is located in the basement. Steel-sash windows are used in both plant and office. Railway scales at the blast-furnaces are used to weigh cars shipments.

The company maintains an engineering staff to confer with and advise users of slag on concrete and other work. This service is in charge of W. W. Lavers, former chief engineer of the Michigan state highway department. A constant check is kept on the screen analysis and weight per cu. ft. of the finished product and on the chemical analysis and specific gravity of each flush of slag from the furnaces. A chemist treats the slag as it comes from the furnace and any found unsuitable is wasted and an adjustment made on the next charge. The quality must meet the strict specifications set up by the company, whose aim is to build up a record for uniformity of product. Steel production-control methods are being applied to slag production.

Another aim of the company is accurate grading to meet any reasonable specification. This problem is complicated by the fact that the state requires round holes and the city square holes in the screens, resulting in almost twenty separate sizes. The plant is designed so that most of these can be produced on the mixing belt.

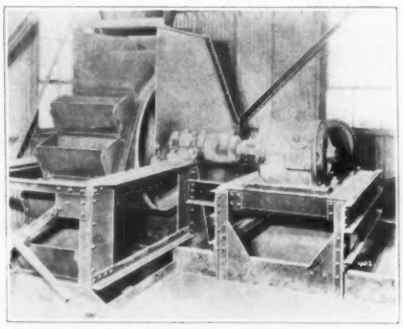
The power for the slag plant is generated by a 3-phase, 60-cycle, 2300-v. 750-kw. turbo-generator located in the engine room of the blast-furnace plant. The generator and feeder panels are also installed in this building. Power is transmitted to the slag plant over a 3-phase, 250,000-cir. mils lead-covered cable, which is carried underground to the slag-plant substation. This substation is in the slag-plant building and houses the transformers, circuit-breakers, and switches.



Single-deck primary scalping screen which receives discharge from pan conveyor and primary gyratory crusher which receives oversize.

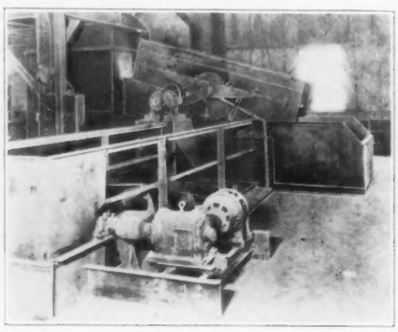
The transformers consist of one bank of three 150-kv.-a. single-phase transformers which reduce the voltage to 440. A 400-A manually-operated oil circuit-breaker is used on the primary side of the transformer bank, while a 600-A I.T.E. air circuit-breaker ties into the secondary-distribution bus. For power-factor correction a 3-phase capacitator is connected to the 2,300-v. line through fuse cut-outs.

Secondary distribution is accomplished by the use of a number of flip-on switches, one for each motor circuit, except for



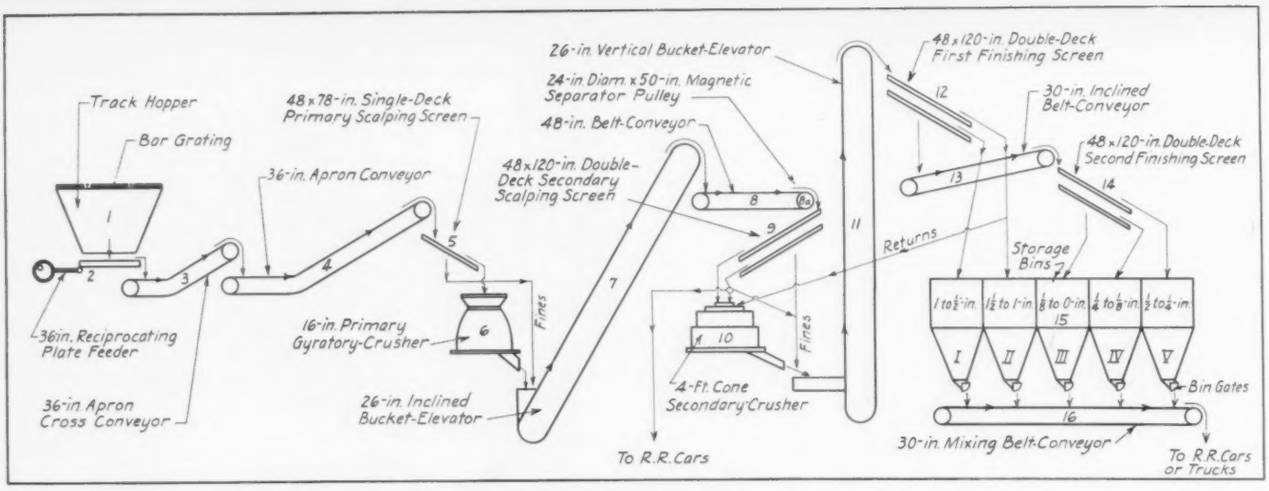
The inclined bucket-elevator which feeds from primary crusher and scalping screen to belt-conveyor and magnetic separator.

The second finishing screen with chutes from first finishing screen to bins and secondary crusher in background.



Speed-reducer drive of belt-conveyor which feeds throughs from first finishing screen shown to second finishing screen.

Horizontal belt-conveyor which feeds slag from elevator to second scalping screen with magnetic-separator at right.




**Flow-sheet of new slag plant of Great Lakes Steel Corp., Zug Island, Detroit, Mich.**

**TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE SLAG PLANT OF THE GREAT LAKES STEEL CORP., DETROIT, MICH.**
**(Key numbers refer to corresponding numbers on accompanying flow-sheet.)**

| Operation | Key | Equipment | Make | Model No., Size, Capacity or Type | Power Source | Power Transmission |
|---|---|---|---|---|---|---|
| Loading and transportation | | Shovel | Bucyrus-Erie | 1½-cu. yd. Diesel | | |
| | | Cars | Western / Differential | 30-cu. yd. | | |
| | | Locomotives | | Steam | | |
| Handling to plant | 1 | Track hopper | | Double 16-ft. by 36-ft., 45-ton | | |
| | 2 | Reciprocating feeders (2) | Jeffrey | Plate, 36-in. | 5-hp. G. E. motor | D. O. James right-angle speed-reducer |
| | 3 | Apron-conveyor | Jeffrey | 36-in., 19-ft. horizontal centers, 44-ft. per min | 5-hp. G. E. motor | D. O. James right-angle speed-reducer |
| | 4 | Apron-conveyor | Jeffrey | 36-in., 42-ft. per min. | 15-hp. G. E. motor | D. O. James right-angle speed-reducer |
| Primary scalping | 5 | Vibrating screen (Oversize to 6; throughs to 7) | Robins Gyrex | 4-ft. by 6½-ft. 6 in., single-deck | 7½-hp. G. E. motor | Allis-Chalmers Texrope |
| Primary crushing | 6 | Gyratory crusher (To 7) | Traylor Bulldog | 16-in | 100-hp. Westinghouse Type CS, induction, reversing motor | Allis-Chalmers Texrope |
| Handling | | (From 5 and 6) | | | | |
| | 7 | Belt-bucket elevator | Jeffrey | Inclined, 26-in., 66-ft. centers, 144 ft. per min. | 20-hp. G. E. motor | D. O. James right-angle speed-reducer |
| | 8 | Belt-conveyor (To 9) | Jeffrey | 48-in., 14½-ft. centers, 100 ft. per min. | 5-hp. G. E. motor | D. O. James right-angle speed-reducer |
| | 8a | Magnetic pulley | Cutler-Hammer | 24-in. diam. by 50-in. | | |
| | | Motor-generator | General Electric | 250/250-v.d.-c.,800-r.p.m., 5-kw., 20-amp., fan-cooled | 10-hp. G. E. induction motor | Direct-connected, flexible coupling |
| Secondary scalping | | (From 8) | | | | |
| | 9 | Vibrating screen (Oversize to 10; throughs to 11) [1] | Robins Gyrex | 4-ft. by 10-ft., double-deck | 7½-hp. G. E. motor | Allis-Chalmers Texrope |
| Secondary crushing | 10 | Cone crusher (To 11) | Symons | 4-ft. | 75-hp. Westinghouse Type CS, induction, reversing | Allis-Chalmers Texrope |
| First sizing | 11 | Belt-bucket elevator | Jeffrey | Vertical 26-in., 66¾-ft. centers, 144 ft. per min. | 20-hp. G. E. motor | D. O. James right-angle speed-reducer |
| | 12 | Vibrating screen (Large sizes to 15; throughs to 13) | Robins Gyrex | 4-ft. by 10-ft., double-deck | 7½-hp. G. E motor | Allis-Chalmers Texrope |
| Second sizing | 13 | Belt-conveyor | Jeffrey | 30-in., 24-ft. centers, 115 ft. per min. | 5-hp. G. E. motor | D. O. James right-angle speed-reducer |
| | 14 | Vibrating screen (All sizes to 15) | Robins Gyrex | 4-ft. by 10 ft., double-deck | 7½-hp. G. E motor | Allis-Chalmers Texrope |
| Storage and loading | | (From 12 and 14) | | | | |
| | 15 | Bins (5) | | Steel, 100-ton each | | |
| | | Bin gates | Jeffrey | Arc-type, hand-wheel controlled | | |
| | 16 | Belt-conveyor (To cars and trucks) | Jeffrey | 30-in., 53-ft. centers, 115 ft. per min. | 5-hp. G. E. motor | D. O. James right-angle speed-reducer |

[1] When making large sizes both decks of this screen are used. In that case top-deck oversize goes to 10; bottom-deck oversize to 10, to 11, or to cars; bottom-deck throughs to 11.

the two larger motors which are controlled through two 400-A I.T.E. air circuit-breakers. From the distribution board separate conduits lead to the individual motors. Each of the fifteen 3-phase, line-start, open-type, induction motors is controlled at the machine by a pushbuttom-operated across-the-line starter.

For ease and surety of operation these motors are interlocked and can be controlled from a General Electric master board, located in such a position that most of the machinery is visible to the operator. The interlocking system is entirely electrical and is arranged so that, if a motor stops for any reason, all the motors between it and the source of material supply will also stop. When the plant is shut down and a check-up on the individual motors is desired, a double-pole, double-throw switch allows the operator to test any one motor independently of the interlocking system.

A 5-kw. General Electric motor-generator set provides the necessary d.-c. power for operating the magnetic-separator pulley. The motor of this set is the key motor for the interlocking system and must be started before the starting of each successive motor in the operation.

The plant has lights and floodlights for night operation. These were useful immediately when the plan went into operation on November 20, about 3 months after construction was started, and at the same time that the government C.W.A. program went into effect. The demand for material for this work was so great that two shifts were put on at once.

Every possible precaution is taken to make this plant safe, both mechanically and electrically, and all the men who work inside it wear Pulmosan respirators. All moving equipment and drives are guarded by railings or housings. The drives of the two bucket-elevators have D. O. James flexible couplings between the motors and the speed-reducers in which are incorporated automatic backstops to prevent reversing of the elevators under load in an emergency. These elevators are steel-inclosed. Trouble lamps on inclosed reels and fire extinguishers are located at convenient points about the plant.

Mechanically the plant has many other interesting features. All the chutes inside the plant are totally inclosed and electrically welded and are provided with lever-controlled flop gates. The walkways around the steel bins are at a level which allows the interior of the bins to be inspected without danger. All the screens discharge into stone boxes which reduce the amount of abrasion in the handling of the slag.

A Wright chain hoist over the primary crusher can be used for servicing or emergencies. Alemite fittings are used throughout the plant. All the conveyor and elevator belting was furnished by the Goodyear Tire & Rubber Co. The vibrating screens and screen cloth were supplied by the Robins Conveying Belt Co., the belt-conveyors, elevators, pan-conveyors, feeders, and bin gates by the Jeffrey Mfg. Co., and the motors and electrical equipment, with a few exceptions, by the General Electric Co. All the screens and crushers are driven through Allis-Chalmers Texrope V-belts and the conveying equipment through D. O. James Mfg. Co. right-angle speed-reducers and flexible couplings. The Traylor Eng. & Mfg. Co. furnished the primary crusher and the Nordberg Mfg. Co. the secondary unit.

The slag division of the Great Lakes Steel Corp. is directed by E. J. McCleary, in charge of production, and K. A. Dietrich, in charge of sales. Both make their headquarters at the slag-plant office.

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## Employment of State and Federal Road Workers at Winter High

Almost a million men were employed in highway and dependent work at the beginning of the year, including men engaged in highway building on State and Federal roads only and those working in related industries, according to figures collected by the Bureau of Public Roads, U. S. Dept. of Agriculture, which is administering the $400,000,000 appropriation for public works highways made by the last Congress. These figures show also that the employment of men on Federal and State highways has reached an all-time high for the winter season.

A grand total of 956,000 men were employed at the beginning of the year on Federal and State highway activities divided as follows: employed at the sites of the highways, 362,000; industrial labor in dependent industries such as stone quarries, gravel pits, etc., 543,000; administrative and supervisory labor, 51,000. Assuming a family of three, the persons supported by these laborers in highway activities number 2,868,000. The number of names of men appearing on the payrolls is materially larger than the figure given due to labor turnover. This record peak of winter employment exceeds the highway employment figures for the summer months of last year.

Highway employment at the beginning of the year, divided by classes of roads, for men engaged on State and Federal work at the sites of the highways was as follows:

| | |
|---|---|
| Public-works highway construction supervised by the Bureau of Public Roads | 134,862 |
| Federal relief highway construction projects supervised by the Bureau of Public Roads | 36,366 |
| Regular Federal-aid highway construction supervised by the Bureau of Public Roads | 1,723 |
| Forest, park and public land road construction supervised by the Bureau of Public Roads | 1,407 |
| State highway construction with State funds | 46,810 |
| State and Federal highway maintenance | 140,832 |
| Total Federal and State employment | 362,000 |

The recent severe weather has caused a decrease in the total number of men employed directly in road building operations but a marked increase of employment is expected as soon as the weather breaks. Over 70 per cent. of the $400,000,000 appropriation for public works highways is involved on highway work already advertised for contract or under construction.

# Lime Industry of Ohio Raises Prices as Well as Wages Under N.R.A.

## Demand for Products Holds Up Well and Prospects for More Business Look Good

NOT only does Ohio rank as the first state in the production of lime, but the total production is more than twice that of any other state. The bulk of this production is centered in the northwestern part of the state in the well-known finishing-lime district.

It is interesting to compare the present situation with that which existed in this district a year ago. From 1918 until 1931 there was a steady increase in the capacity of the plants manufacturing finishing lime. This increased capacity was accounted for by the construction of both vertical and rotary kilns. During 1932 no new kilns were constructed in this field, nor were any built during 1933. One plant that was operating a year ago is now shut down with little prospect of its being again operated soon.

While much has been said about excess capacity in various industries, and there was undoubtedly more capacity in this territory than was needed in 1933, still the volume, considering business conditions generally, was very satisfactory. This was probably due to the aggressive sales policies of some of the finishing-lime manufacturers and to some of the promotional work that has been done by the Finishing Lime Assn. of Ohio.

While the volume of business was about all that could be expected, prices were very low throughout the year. New prices have recently been filed, but that was after the year's requirements had been taken care of. A few years ago finishing lime was selling to dealers at $12.50 per ton at the plant. During the first part of 1932 the price generally quoted was $5.50 with at least one producer quoting $4.75. At the time the code became effective on Oct. 23 the published price was $9 per ton and as this is written the published price is $10.50. A cash discount of 25 c. per ton is allowed, and as a general rule jobbers who handle this product are allowed a commission of 10 per cent. Masons' hydrate and agricultural hydrate were quoted at $4.75 and $4.25 respectively at the first of the year. After deducting from the latter figure, 45 c. sales commission, 25 c. cash discount, $1 for bags, $1.10 for coal, $1.20 per ton for the cost of the stone delivered to the kilns, and various amounts for labor, compensation insurance, general insurance, taxes, power, and other direct operating costs, to say nothing of administrative and sales-promotional expenses, it was necessary to uncork the red-ink bottle. Nor was the bottle of red ink hard to find during 1932 or the early part of 1933. The price now being quoted on these products in the finishing-lime district is $8.50 per ton.

Burned lime for glass, fluxing and other industrial uses has been increased in price from $4 to $7 per ton.

Comparing present prices with prices quoted a year ago makes it look like a very pretty picture for the manufacturer until he compares present prices with the prevailing schedules in 1926. Production costs are now probably higher than at that time, yet selling prices are much lower.

Greater activity is noted in the promotion of fibered lime for base coat work, ready-mixed brick mortar which is displacing some tonnage of masons' hydrate, acoustical plasters, plasters finished, dry paints, dairy lime and other specialties.

Both trade-journal and direct-mail advertising appropriations have been greatly reduced. Four or five years ago one of the leading trade journals of the building supply trade was carrying the advertising of six finishing-lime manufacturers. Such advertising has practically disappeared.

Plasters' caps, time books, advertising novelties and printed matter which used to be distributed to dealers in such quantities that much of it was of little value to the advertiser, have not ceased to flow from the sales offices of the various companies, but the stream has decreased in size and more attention is being paid to the probable results that will come from each advertising dollar spent. While sales forces have been reduced, there is no lack of sufficient personal contact in the field. This is true not only regarding jobs taking more than a car-load of lime, but even on smaller jobs the majority of producers are generally represented in an effort to place their particular brand on that job. Dealers both large and small are visited oftener than they have orders to place.

FOR several years northwestern Ohio manufacturers have been selling building lime through dealers only and there has been very little deviation from this policy.

A study of the balance-sheets of some of the producers indicates that credit has been extended liberally and that collections have been slow. Receivables in some instances are entirely out of proportion to the volume of business and the price of the product.

The Code of Fair Competition is now working smoothly from a sales standpoint and a merchandising plan has been drawn up and submitted to

the Administrator. Gibsonburg, O., has been designated as the basing point for this district known as 5-A. This plan provides among other things that only motor trucks belonging to or hired by dealers or *bona fide* distributors shall be loaded at plants in District 5-A, and that all finishing hydrated lime so loaded shall be charged for at $1 per ton above the base price. The filed price lists of some producers indicate that they are making this additional charge on all kinds of lime loaded in trucks and that others are not making the charge on agricultural lime.

The territory in Ohio outside the finishing-lime district is designated District 5-B. Basing points for this district are Marble Cliff, Marblehead and Durbin. L. E. Johnson, secretary of the Finishing Lime Assn. of Ohio is secretary of both Districts 5-A and 5-B. His office is in Toledo.

Every lime plant has some spalls, and these are consumed by the steel trade as raw dolomite or are burned in a rotary kiln into lime or roasted dolomite, sold as railroad ballast, crushed stone for road or other building purposes, the fines going to the agricultural or glass trades or other industrial uses or being wasted.

Prices on raw dolomite to the steel trade at the beginning of the year were pretty well established at 39 c. per gross ton for blast-furnace sizes and 40 c. per gross ton for material going to open-hearth works. Prices quoted for the last quarter of 1933 and for the first quarter of 1934 were 60 c. per gross ton for blast-furnace sizes, 65 c. per gross ton for open-hearth sizes over ⅜ in., and 75 c. per ton for the rice size. The volume of steel business during 1933 was much better than during 1932 and the forecasts indicate a good first quarter just ahead.

Railroad ballast orders were very light and the prices comparatively low. With car-loadings increasing, 1934 should be a better year for producers supplying the railroads.

A diversion of part of the gasoline tax from the highway department to the dole has greatly reduced the tonnage of crushed stone for highway work. While the tonnage has been smaller than last year, the prices have been somewhat better.

THE state highway department is becoming more critical of the preparation of the stone, particularly that used for the top course of bituminous-concrete roads. The larger producers are now washing the stone used for highway construction. Incidentally, this is resulting in a new market for the "fines" which, when washed and classified properly, are marketed as limestone sand. As quarries in this part of the state must be pumped continuously to keep them dry, the problem of washing is not serious, neither is the operation very expensive.

On account of the financial condition of the farmer the demand for agricultural hydrate and limestone was light. Prices on agricultural limestone being quoted for spring delivery are from 30 c. to 60 c. per ton higher than those quoted last year.

The last two years have seen greater activity in the production of dried stone. Two large installations in 1932 greatly increased the capacity in the district. The classification of dried stone for the glass trade leaves the minus 80-mesh material, which is sold as agricultural limestone or for rock-dusting coal mines to prevent explosions or is further classified for asphalt filler or rubber filler. Dried limestone sold to the glass trade is generally being priced at $1.50 per ton at the plants.

The plants of all producers have been well maintained and are in excellent operating condition.

Under the lime code the wage scales start at 37½ c. an hr. for common labor. Last year the starting point for the scales varied from 20 c. to 32 c. in the various plants. Representatives of the American Federation of Labor have succeeded in enrolling most of the workers in the Federation-controlled quarry workers' union. No labor troubles of any kind have been reported.

TRANSPORTATION is one of the big factors to be considered in marketing lime and stone products. Rates on lime in Central Freight Assn. territory are now made by using the scale for 15-ton cars that was prescribed by the Interstate Commerce Commission a few years ago, and applying that scale on cars containing 15 tons and 80 per cent. of that scale on 25-ton cars. These rates now apply on all kinds of lime except agricultural lime between points in the state of Ohio. To destinations in the east the 15-ton rates apply on all kinds of lime except agricultural and fluxing, while the 80-per cent. basis apply only on agricultural and fluxing lime with a car-load minimum weight of 25 tons. A complaint attacking the rates to the east and rates within eastern territory has been filed but an effort is being made to have this settled without a hearing before the commission. For the past thirteen or more years the Ohio lime rates have been before the commission in various cases.

During 1932 the motor truck was quite a big factor in the distribution of the agricultural tonnage during the autumn season, but the addition of the $1 per ton for loading trucks which was in effect during the latter part of 1933 greatly reduced the trucked tonnage. The elimination of the emergency charge by the railroads and the increase in the price of gasoline and tires also helped to make trucking less profitable.

For a time almost all the lime used in Detroit was trucked in, but the refusal of building-supply dealers to accept shipments by truck has resulted in a discontinuance of truck shipments into Michigan. This is also true of shipments into Indiana.

A mileage scale of rates has been prescribed by the Interstate Commerce Commission to apply on crushed stone, sand and gravel within the state of Ohio. This has resulted in many increases in the rates on crushed stone from northwestern Ohio points and has encouraged the trucking of crushed stone. It is estimated that a great deal more than half of the crushed-stone tonnage from this district is trucked. The trucking radius is as much as 55 mi. and the rates from 2 c. to 4 c. per ton-mile.

For some time the railroads have been contemplating an increase in the rates on stone in box-cars. On stone going to the glass plants the same rate that applies to open-top cars also applies to shipments in box-cars. The carriers now are proposing to raise these rates to 13 per cent. of the first-class rate.

Most of the manufacturers will not give out any information as to their financial position. Some frankly admit they have been losing money. Credit ratings indicate that, almost without exception, they are paying their current obligations promptly. For the first time in several years manufacturers are facing the new year with a feeling that better times are here again.

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## *Shovel Selection* (from page 30)

be built, and still stand up in digging, the better it is, because less power will be consumed. To achieve this is a real problem. There are machines so light that they will be torn apart in rock digging. There are others so heavy that they must either be much too slow or overpowered. Many power shovels of 1½-cu.yd. capacity or less are a little light for rock excavation. They are built so because the major market for shovels of these sizes is earth excavation, where greater speed and larger dipper for the weight are desirable in the relatively-easy digging.

Neither can the ability of a shovel be gaged by checking the horsepower available in its power-plant. Extra horsepower may be required to swing unnecessary weight. It may be used for higher speeds than are desirable in rock digging. While an underpowered shovel can not be expected to give good output, intelligent use of a smaller engine or motor means lower fuel or power bills, an important item in shovel cost. In this connection it should be noted that electric-powered shovels, due to the characteristics of the motors used, have less rated horsepower than gasoline or Diesel engines on the same sizes. Due to its high torque at low speeds, the Diesel engine usually is of smaller horsepower than the corresponding gasoline plant.

High speed of hoist or of swing is often brought forward as a reason for high output on a shovel. Speed is, of course, essential, but a slower speed with corresponding greater power is better for hard digging. Acceleration is often much more important than top speed, because of the short intervals during which the motions are used at any one time. It is especially important that a balance be maintained between the speeds of the three digging motions. A power shovel with a lightning-fast swing speed is impressive to watch, until you analyze its performance. If the full dipper is pulled from the bank and swung toward the truck or car, it should be hoisted high enough to clear the side *just* before reaching it. This is usually figured on a one-quarter swing from the bank to the vehicle. If the swing must be stopped until the hoist catches up, or *vice versa*, precious seconds are wasted.

Manufacturers have long differed on the proper construction of the shovel boom and dipper sticks. The two types of construction differ in running the dipper sticks either through the boom (called inside sticks, Fig. 6), or on either side of the boom (called outside sticks, Fig. 7). The outside type is favored by most builders. Some designers believe that the twisting action to which the boom is subjected can be resisted better by a box-girder structure than by two split members. In order to build the split boom as strong as the box boom, it must be heavier. A corresponding weight must be added at the rear of the shovel as a counter-balance. This slows down the swing, unless unusual power is added to compensate for the extra swing load. While on the smaller sizes of power shovels there is little to choose between the two types of construction, the advantage of the outside dipper sticks is marked on large machines.

Simplicity of design is essential for low maintenance cost of the power shovel. Every extra gear and shaft and sheave means waste power and added parts to wear. The present increased tendency toward inclosed gears and chains not only decreases friction and wear, but protects workmen. This matter of inclosing all working parts can be carried too far, however. Parts requiring periodic adjustment should be readily accessible.

Wire-rope manufacturers recommend that diameters of sheaves and drums be 25 to 30 times the rope diameter. For other reasons this is not a general practice on shovels, but sharp bends in the wire rope and especially reverse bends are to be avoided. The cost of rope can be held down if shovels have large drums and sheaves and simple reeving.

One feature now standard on many shovels is the power-operated dipper trip. This device enables the operator to release the dipper-door latch quickly and easily, saving time on each dipper load and materially increasing the day's output. Because the operator is saved the fatigue of pulling a dump rope, he is fresher, and better able to maintain the pace throughout the shift.

An important point not directly related to shovel design is the repair-parts service offered by the builder. Probably no piece of machinery undergoes such severe service as a power shovel. So it is to be expected that new parts will be required, and in a hurry. The cost of making repairs may not run so high, but the cost of shutting down the plant until the shovel is again in service may run into thousands of dollars. Some manufacturers are equipped to furnish repair parts immediately wherever their shovels are in use. Such service is of vital importance, and deserves consideration in selecting shovels.

The modern quarry shovel represents a sizable investment, the returns from which are measured in its output of rock or gravel or clay. It is curious to note how often this valuable piece of equipment is put in charge of an inexperienced operator. Not only does such a practice curtail the potential output, but also, because of unwitting abuse and neglect, it seriously shortens the life of the machine. The increase in daily wage for a competent shovel runner is just a few dollars. His knowledge and skill will more than pay the difference.

# Cement-Machinery Lubrication Demands Centralized Responsibility

## Operating Economy Depends on More Factors than Price of Lubricants

By EDMUND S. GLAUCH

IN a previous article on the lubrication of equipment employed in the pit and quarry industries[1] we have taken up the lubrication of such equipment as power-shovels, crushers, screens, which are, of course, also used in the cement industry, but in this article we shall confine our discussion to that equipment and machinery used in the cement mill beyond the stage of primary crushing.

That correct lubrication is important in the manufacture of cement can readily be understood by everyone familiar with its manufacture. Any bearing failures due to poor lubrication, which stop production, are costly and quite frequently could be prevented by closer supervision being given to the grade of lubricant and its proper application.

There are two processes generally used in the manufacture of Portland cement: the dry process, and the wet process. The equipment employed in the above processes is practically the same, except that in the wet process pumps must be used to handle the slurry, whereas in the dry process the material is handled by conveyors.

*Exclusion of Dust.*—It is practically impossible to confine all the dust when handling finely-pulverized material. This applies especially to the dry process and this makes the problem of proper lubrication still more difficult.

This fine dust is of an abrasive nature and when mixed with an oil, acts as a lapping compound. It is to prevent this action that many machinery builders designed their equipment for grease lubrication, the grease forming a seal at the ends of the bearing and retarding the entrance of this fine abrasive dust into the wearing surfaces. There will, of course, be found on some equipment bearings designed for oil lubrication, either bath or circulating. Bearings of this type have been provided with tight covers and seals which are designed to prevent the entrance of dust and also to prevent oil leakage.

The raw material must be reduced in fineness so that practically all of it will pass through a 200-mesh screen and in some instances a large percentage must pass through a 325-mesh screen. This grinding or pulverizing is done in ball-, tube-, rod- and compartment mills, or hammer-mills. These are all of the impact type, the material being reduced by blows, either from the revolving hammers in a hammer-mill or the tumbling of the balls or rods in the other types. In addition to the above-mentioned types of mills, others known as roller, ring-roll, ring-ball and table-roller mills are employed and these crush the material to be reduced.

*Ball-, Tube- and Compartment Mills.*—The ball-, tube- and compartment mills are usually supported by a bearing at each end. These bearings are often referred to as trunnion bearings; however, the term "trunnion bearings" is also used in connection with mills and kilns when the shell is carried by tires mounted on the shell, the tires revolving on rollers supported by trunnion bearings.

In order to differentiate we shall refer to the large end bearings as "head trunnion bearings" and the others as "tire trunnion bearings."

These head trunnion bearings are made quite large in order to reduce the unit loading on them, also because the journal must be hollow so that material can be fed into the mill at one end and removed at the other.

Some tube-mills are supported on tire trunnion bearings similar to those used on driers and kilns.

Where the mill bearings are designed for grease lubrication, it is usually found advisable to use a high-melting-point product. This is necessary, especially on the mills grinding hot clinker, due to the high operating temperatures. A grease having a melting point in excess of 300 deg. F. usually will be found suitable, although in some cases a grease with a still higher melting point will be required.

Grease for this work is usually shipped in slab or block form, which makes it possible to cut it into pieces to suit the opening on the bearing. This is more convenient than if the grease had to be cut out of a barrel.

This type of grease is usually a soda-soap grease which has been manufactured in a fire-heated kettle in order to dehydrate the mixture. A grease for this high-temperature service can not be made in the usual steam-jacketed kettle employed in the manufacture of lime-soap and regular cup greases.

Should the bearings be designed for oil lubrication, the oil being distributed by means of gear-collar, scoops or ring oiling, then a mineral cylinder oil, having a viscosity of from 135 to 160 sec. at 210 deg. F., will usually meet the requirements.

Where bearings are lubricated by means of wick feed or other oiling devices, heavy oil will be required, but viscosity will be governed by the type of feeding mechanism. In cases of this kind it will be advisable to consult the engineering department of the company supplying the lubricants.

In some plants bearings are packed with a wool-yarn grease instead of the block grease previously mentioned.

On some of the recently-constructed compartment

[1] *Lubrication of Equipment Employed in the Pit and Quarry Industry*, by Edmond S. Glauch. PIT AND QUARRY, xxiii, 7, p. 43.

mills roller-bearings have been used. These are usually lubricated with an oil-circulating system, wherein oil is passed through a filter after use and before being returned to the bearings.

On one design a grease cup is provided on each side of the head trunnion bearing in order to provide a grease seal, which serves in a dual capacity, keeping oil in and dust out. Abrasive dust mixed with oil can not be allowed to reach the highly-finished surfaces of a roller-bearing. The oil continually passing through the bearings will tend to flush out any dust that may find its way past the seals into the clearance spaces.

An oil of 500 to 750 sec. viscosity at 100 deg. F. will, in most cases, be suitable for this service. The oil should, however, be of a grade suitable for circulating systems and one that readily separates from any impurities that may be accumulated, otherwise rapid oxidation, which will impair its lubricating qualities, will occur.

Tire trunnion bearings, when designed for grease lubrication, can be lubricated with the same grade of grease recommended for head trunnion bearings; also, at times, these bearings are lubricated with a wool-yarn grease or are packed with wool yarn and an oil having a viscosity of from 500 to 800 sec. at 100 deg. F.

Wool-yarn grease is usually a soft soda-soap grease with which approximately 10 per cent. of wool yarn has been thoroughly mixed.

For tire trunnion bearings of roller-bearing construction an oil of from 500 to 600 sec. viscosity at 100 deg. F. will usually be found satisfactory.

The girth gears on ball- and tube-mills can usually be properly lubricated with a heavy oil having a viscosity of approximately 1,000 sec. at 100 deg. F., if a slush pan is installed, although local conditions may make it advisable to use a heavier lubricant which will provide a heavier protective coating on the teeth. A petroleum product, having a viscosity approximately 1,000 sec. at 210 deg. F., is often used with good results.

Wherever the lubricant is applied by brush or paddle, it is advisable to use a heavier product than when the gears or pinions dip into the lubricant in a slush pan. Heat-resisting gear greases, containing from 10 to 20 per cent. of pulverized flake graphite, are sometimes used with good results.

Where worm gears are employed in the drive of the mill, an oil having the same viscosity as a steam cylinder oil, namely, 135 to 160 sec. at 210 deg. F., will be found suitable.

For the motor and countershaft bearings, when ring- or chain-oiled, an oil of from 200 to 300 sec. at 100 deg. F. can be used. For hand oiling a heavier oil should be used. Where the lubricant is applied by grease cups or a pressure gun, a No. 2 soda-soap grease should be used.

*Roller-Mills.*—Roller-mills as built by the different manufacturers vary somewhat in design, and the lubrication of this type of mill will, therefore, depend upon the provisions made by the machine builder. The general recommendations which will apply in most cases may, in some instances, have to be altered to suit individual conditions.

When the mill is gear-driven, the pinion and bevel gear are usually lubricated by the pinion dipping into the oil and carrying it to the bevel gear. An oil similar to extra-heavy turbine oil, with a viscosity of 500 to 600 sec. at 100 deg. F., can be used with good results.

The same oil can also be used on pinion-shaft bearings, if they are ring-oiled. Should these bearings be designed for grease lubrication, and grease cups or high-pressure fittings be installed, then a No. 2 soda-soap grease should be used.

The roller spindles, when designed for oil lubrication, can be lubricated with the same oil used on the bevel gear and pinion. When these spindles are designed for grease lubrication, then a No. 3 soda-soap grease will be necessary, and if hot material is being ground, then it may be necessary to use a heat-resisting grease somewhat heavier than that just mentioned.

Thrust and guide bearings, when designed for oil, can generally be lubricated with the grade of oil mentioned above.

On bearings where grease is required, a No. 2 soda-soap grease will, under most conditions, provide satisfactory lubrication.

*Ring-Ball Mills.*—Ring-ball mills are made in several types, but lubrication is accomplished in practically the same manner on all. An oil reservoir is filled to the proper level and the oil lubricates the bevel gear and pinion by the splash method, the lower guide and thrust bearings being bath-oiled. Extra-heavy turbine oil, having a viscosity of from 500 to 600 sec. at 100 deg. F., is recommended by the manufacturer.

One type of ball-mill has incorporated in its design a circulating system whereby the oil, after use, drains into a sump from which it is pumped through a strainer and then to the bearings. The oil just mentioned will meet the requirements set up on this type of mill.

On another mill of this type, driven by a vertical motor, the upper guide bearing requires a grease suitable for ball-bearings operating at high temperature. A No. 3 soda-soap grease meets these requirements. This same grease can be used on these mills where grease cups or high-pressure fittings are provided for application of the lubricant.

*Ring-Roll Mills.*—Mills of this type do not, as a rule, require any special lubricants, and if the bearings are of the ball or roller type, they can be lubricated with a No. 2 soda-soap grease. Should plain bearings be used, then a heavy machine oil, having a viscosity of from 800 to 1,000 sec. at 100 deg. F., will, in the average mill, provide the proper lubrication.

*Table-Roller Mills.*—In some of the earlier designs of this type of mill grease was forced to the bearings of the roller through a hole in the center of the supporting shaft, a high-pressure fitting or compression cup being provided for this purpose at the outer end. The bevel-gear drive, shaft bearings and thrust bearings are lubricated with oil.

The latest design of table-roller mills, as built by one manufacturer, provides for oil lubrication, using a pumping unit to force the oil to the various bearings.

In general the lubricants for these mills can be the same as recommended for other roller-mills; that is, an extra-heavy turbine oil of 500 to 600 sec. viscosity at 100 deg. F. where oil is required, and a No. 2 or 3 soda-soap grease, where grease must be used.

*Hammer-mills.*—In this type of mill the rotating members are mounted on a shaft which is supported by a bearing at each end. These bearings are generally outside the chamber where pulverizing takes place, and are constructed so as to be protected from dust.

If these are plain bearings, designed for ring- or chain-oiling, an oil having a viscosity of from 300 to 400 sec. at 100 deg. F. will, under average conditions, meet the requirements.

Ball- and roller-bearings are used on a great many hammer-mills manufactured to-day. On ball-bearing units, designed for bath or circulation oiling, an oil of 500 to 600 sec. at 100 deg. F. will be found satisfactory. When grease is used, a No. 2 or No. 3 cup grease or a No. 2 soda-soap grease will be required.

On roller-bearing units when bath-oiled, it will be better to use an oil similar to a cylinder oil, one having a viscosity of 135 to 160 sec. at 210 deg. F. When a circulating system is employed, a turbine oil of 500 to 600 sec. viscosity at 100 deg. F. should be used. On roller-bearings designed for grease lubrication a No. 2 soda-soap grease meets the requirements.

The writer has known of instances where on this type of mill a No. 3 graphite cup grease gave very good results, and reduced the bearing temperatures.

*Driers.*—Driers are large cylinders supported by two riding rings, often referred to as tires, which run on rollers mounted in trunnion bearings. They operate at very low speeds, and speed, therefore, does not set up any special lubricating problems.

Bearing and gear-tooth pressures are rather high and, also, there is considerable heat which is radiated from the drier shell.

Therefore, on tire trunnion bearings designed for grease a high-melting-point soda-base grease must be used. This is usually shipped in blocks and can readily be cut into smaller pieces for application.

On bearings designed for oil a heavy-bodied oil must be used. Special attention must be given to providing closures which will keep out the abrasive dust which is present.

Some of the equipment recently built has tire trunnion bearings equipped with roller-bearings. When bath-oiling this type of bearing, a mineral cylinder oil, having a viscosity of 135 to 165 sec. at 100 deg. F., will give good results. Should these bearings be connected to a circulating system, then an oil similar to extra-heavy turbine oil should be used, the viscosity of the oil being from 500 to 600 sec. at 100 deg. F.

The girth gear and pinion, also the drive gears if of the open spur-gear type, should be lubricated with a heavy-bodied gear lubricant. In most cases one having a viscosity of 1,000 sec. at 210 deg. F. will meet the requirements. In cases of extreme heat the lubricant should have a higher viscosity.

Heat-resisting adhesive gear greases, containing from 10 to 20 per cent. of lubricating flake graphite, will also provide good lubrication.

*Clinker Coolers.*—In general the conditions on this equipment are similar to those that exist on driers and the same general recommendations will apply.

*Rotary Kilns.*—These kilns, also, are similar in construction to driers, but on larger sizes three or more riding rings are provided to carry the weight of the equipment. High temperatures are necessary to calcine the material and, for this reason, the gears and bearings are usually much hotter on kilns than on driers and coolers. On tire trunnion bearings, therefore, a grease of the soda-soap type, with an extremely high melting point, must be used. When roller-bearings are used, a good mineral cylinder oil will be necessary and the viscosity should be not less than 160 sec. at 210 deg. F. When designed for grease lubrication, a soda-soap grease suitable for roller-bearings will be necessary. Usually a No. 3 or No. 5 soda-soap grease will be satisfactory, depending upon the operating temperatures.

The girth gears will require an adhesive product and if of the straight mineral type, the viscosity should be from 1,500 to 2,000 sec. at 210 deg. F. The average open-gear lubricants will thin to such an extent, under temperatures existing on kiln girth gears, that they will run off and leave the teeth without protection or lubrication.

When inclosed speed-reducers are used in connection with the kiln-driving mechanism, the above-mentioned heavy-bodied lubricants can not be used on this unit. The oil required will depend on the design of the unit itself. Generally, however, an oil having a viscosity from 150 to 200 sec. at 210 deg. F. can be used, but local conditions together with the manufacturer's recommendations may make it necessary to use either a lighter or heavier lubricant.

*Auxiliary Equipment.*—In connection with the larger equipment used in cement manufacture will be found auxiliaries which are used to feed the material into mills and other equipment. These auxiliaries usually do not present any difficult lubrication problems.

A No. 2 or 3 cup grease will, in most cases, answer where grease cups or high-pressure fittings are installed. If hot material is being handled, then a No. 2 or 3 soda-soap grease should be used. On worm drives a cylinder oil or gear oil having a similar viscosity should be used.

Wherever silent-chain drives are used, and these should be inclosed, a machine oil of 250 to 300 sec. viscosity at 100 deg. F. can be used with good results.

*Conveying Equipment.*—The type of equipment used for conveying the material in process will, of course, depend upon the process of manufacture. In the wet process the material is handled by a

pressure pumping system. Dry material is handled with screw-, flight- or belt-conveyors.

Lubrication and protection against dust are very important, if replacements are to be kept at the minimum. Oil and grease are used, depending upon the design of the parts requiring lubrication.

Conveyor rolls, when oil is used, can in most instances be lubricated with an oil of from 350 to 500 sec. viscosity, at 100 deg. F. If exceedingly high temperatures prevail, an oil of higher viscosity will be more economical.

Rollers provided with grease cups or high-pressure fittings can best be lubricated with grease. Grease also provides a better seal against the entrance of dust.

A general recommendation will be a No. 2 or 3 soda-soap grease, depending upon temperature conditions. When lubricating these parts with grease, it is advisable to force sufficient new grease into the bearing so that a small amount is forced out at the edges of the bearings. In this way dust will be prevented from entering and damaging the bearing surface.

Belt-conveyor rollers are usually constructed with ball- or roller-bearings and sufficient grease must be forced into the bearings to exclude dust. A No. 2 soda-soap grease suitable for anti-friction bearings should be used. Where cold material is being handled, or where the conveyor is outdoors subject to low temperatures, a No. 2 or No. 3 cup grease will be better.

It might be well to mention that cup greases are generally lime-base greases and are insoluble in water, whereas soda-base greases are soluble in water and can not be used with good results when water is present. Soda-base greases have a higher melting point than lime-base greases and, therefore, are better suited for high-temperature conditions.

*Summary.*—As lubrication plays an important part in the manufacture of cement from the standpoint of keeping down power costs and preventing delays in production, it should receive proper attention and supervision. Responsibility for the lubrication of all the equipment should be assigned to one man. He can work out lubrication schedules and select the proper lubricants for the various pieces of equipment.

The number of grades of oils and greases should be kept as low as possible, consistent with good lubrication practice. This will keep down inventories and also will simplify the work of application.

Unless a regular schedule is followed, some bearings will be neglected and some may receive more attention than is necessary. The bearings in out-of-the-way places are those most likely to be overlooked or neglected.

Bearings lubricated with oil by bath-oiling, ring- or chain-oiling, should periodically be drained completely and new oil used to refill them to the proper level.

Between oil changes new oil should be added to maintain correct levels. The oil in circulating systems should also be examined at regular intervals so that it can be replaced when it becomes unfit for further service.

Proper storage facilities for lubricants are always a good investment. They reduce fire hazards and also protect oils and greases from the surrounding dust. A separate building of fireproof construction with suitable tanks and racks should be provided.

After satisfactory lubricants have been adopted changes should not be made without some proof that better results will be obtained in service. Changing oils and greases, merely because those offered may be cheaper by the gallon or pound, is often a step in the wrong direction, for actual test very often results in the loss of a bearing or in the use of a greater quantity of lubricant, which, over a period of time, would mean a higher cost rather than a saving.

The responsibility of the company offering lubricants should be considered, as well as the price per gallon or pound.

The larger oil companies, also the larger grease manufacturers, have on their staffs engineers who will study any special problems and make recommendations. This service often results in lubrication economies without the necessity of making any radical changes or expenditures for devices for the application of lubricants.

## Public-Works Highway Progress

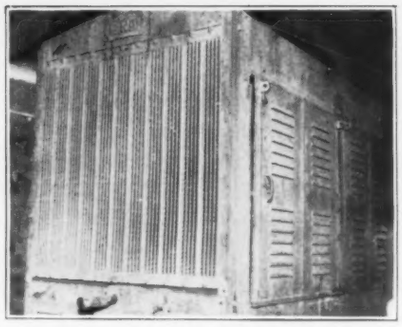
Progress made on emergency construction of public works highways to February 24 under the supervision of the U. S. Bureau of Public Roads shows a total of 6,265 projects, estimated to cost $318,119,000, had been advertised for contract or begun by day labor employed directly by the highway authorities. The cost of the day labor projects included in the above is estimated at $22,926,000.

Of the 5,476 projects awarded for construction, 3,654 were under construction on February 24, and 681 were completed. The work under construction, which is estimated to cost $212,826,000, was giving regular employment to 125,649 men.

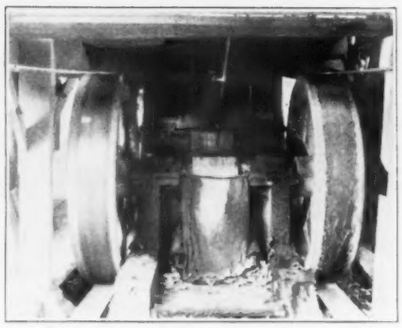
In the whole country, work advertised for contract or started by day labor employed directly by the highway authorities involved 74.5 per cent. of the $400,000,000 provided for public works highways under Section 204 of the National Industrial Recovery Act.

## A. C. I. Convention Proceedings of Great Interest to Producers

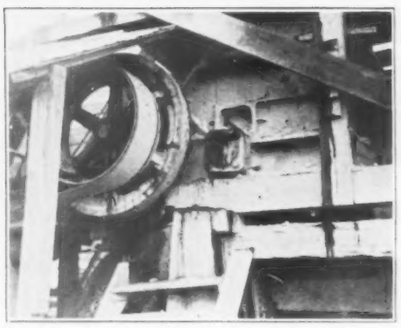
The Thirtieth Annual Convention of the American Concrete Institute, held at Toronto, Ont., Feb. 20-22, was of unusual interest to producers of aggregates and cement. Among the subjects discussed were the durability of concrete and aggregates and the protection afforded a poor quality aggregate by concrete. R. B. Young of the Hydro-Electric Power Commission of Ontario coöperated in the preparation of papers discussing the heating of concrete in cold weather and its protection. H. S. Van Scoyoc of the Canada Cement Co., Montreal, Que., outlined the trend of developments in railway bridge design. Arthur R. Lord, Chicago, Ill., was elected president for 1934 and Harvey Whipple, Detroit, Mich., was reelected secretary-treasurer.



The 6-cyl. 150-hp. gasoline-engine which operates the entire plant.



The 18-in. by 32-in. jaw crusher used for primary reduction and its belt drive.



The 12-in. by 22-in. belt-driven jaw crusher used for secondary reduction.

# Single Gasoline Engine Used to Operate New York Crushed-Stone Plant

## Temporary Plant Built for Road Job Now Permanent Commercial Operation

THE crushed-stone plant of the Greene County Crushed Stone Co., Cairo, N. Y., has an interesting though brief history. It was opened in August, 1932, by the Peckham Road Corp., White Plains, N. Y., as a temporary plant to supply material for a contract, which this company had been awarded for a highway west of Cairo. After completion of the contract it was decided to continue operation as a permanent commercial plant. Shipments are made by truck only to a territory which is somewhat limited by the mountainous area in which the plant is located.

As this was first intended to be a temporary plant a large gasoline-engine power unit was installed. This proved to be so economical that it was decided to continue to use gasoline power when the plant became a permanent operation, although electric power was readily available. This plant has a capacity of 30 tons per hr., and is located a short distance off New York State Highway No. 145 about 3 mi. west of Cairo, in the heart of the Catskills.

There is very little overburden on the deposit and this is removed with a shovel and a Caterpillar 30 tractor equipped with a "bulldozer." The deposit is a calcareous sandstone which is broken and stratified to some extent. The working face is 25 ft. high, and under this is a thin layer of shale below which is an ample supply of good stone. Drilling is done with two Ingersoll-Rand 68X air drills which are operated by a portable Ingersoll-Rand gasoline-driven air-compressor. Shots are made with 40-per cent. quarry gelatin, electrically detonated. Little secondary shooting is necessary because of the nature of the stone. An Erie 1-cu.yd. steam shovel loads the excavated material into a Brockway 6-cu. yd. dump truck which hauls it a distance of a few hundred feet to the plant.

The quarry level is somewhat higher than the plant floor level and the truck dumps directly from this level into the Acme 18-in. by 32-in. primary jaw

The storage-bins and revolving sizing screen with bucket-elevator from crushers at right.

The ⅝-cu.yd. gasoline-engine driven crawler shovel shown loading from stock-piles into truck.

crusher. The stone from this crusher is discharged to a 12-in. Acme belt-bucket elevator operating on 40-ft. centers. The elevator discharges the stone to the 4-ft. by 20-ft. Acme revolving screen which is mounted on the storage-bin structure. Ordinarily this screen has ¾-in., 1¼-in., and 3½-in. openings on its main barrel and has two dust jackets with openings of ¼-in. and 3/16-in., respectively, over the ¾-in. section.

The plus 3½-in. stone rejected by this screen is chuted to a Reliance 12-in. by 22-in. secondary jaw crusher. This reduces it to minus ¾-in., and the product is discharged to the same bucket-elevator feeding the screen. All the five sizes, including the dust, produced by this screen, are discharged to the 5 compartments of the 250-ton capacity timber storage-bin. Lever-operated bottom-discharge gates load trucks for shipment.

Much of the dust produced is sold for resurfacing roads and the remainder is wasted. The excess of other sizes is loaded into two Koehring steel-wheel Dumptors which dump to stock-piles. A General Excavator ⅝-cu.yd. crawler shovel rehandles these materials from the stock-piles to trucks for shipment. This shovel has a Caterpillar gasoline engine. A Barber-Greene stock-pile loader is also used for rehandling. The entire plant is operated by a 150-hp., 6-cyl. Le Roi gasoline engine.

## Recording Kiln-Brick Performance

By T. N. HAFFNER
*Supt., Keystone Portland Cement Co., Bath, Pa.*

A GRAPHIC method of showing the length of service of kiln brick, which was designed specifically for this purpose but may be used for a wide variety of purposes is shown in the accompanying illustration. The point of departure from other charts used for the same purpose lies in using vertical distance for the time elapsed between significant operations.

The preparation of this chart was based on several assumptions: (1) that the cost of the brick, either absolute or per unit of product, in some time past is of no value, as it may have fluctuated widely from other causes than suitability for present use; (2) that length of life in all locations and for all kinds of brick used shall be instantly discernible, and that from this length of life present costs be figured and compared; (3) that certain events, like shutting down a kiln long enough to affect the brick, can be immediately seen; and (4) that the chart shall be reasonably easy to keep up. Copies can be made by blue-printing, if necessary, although a better chart is possible if color be used, which precludes the printing process. The cost of kiln brick is so important an item that no attempt was made to clutter up the chart with other information, such as the life of burner tips or driving gears. This is an unadultered brick chart.

In making up the chart it is first drawn in ink on tracing cloth and a brown negative is made. From this a blue-line print on white ground is made if color is used to show the quality and the make of the brick, or a brown-line print on white ground on thin paper if cross-hatching is used for the purpose of making copies of the completed chart. The color or cross-hatching is laid on these white prints, using different but distinct shades of red for the various qualities of brick of "A-B-C" company's manufacture, green for "D-E-F" company, etc. The first space filled out usually has a large number of unknown brick which may be shown in black. Any kiln shut-down sufficiently long to injure the brick is shown by a horizontal black-ink line at its appropriate position on the time scale. As only the shutting-down and not the length of the shut-down affects the brick, the length of the shut-down is not shown. The burning of cement clinkers different from standard (high-early-strength, for example) may be shown by using horizontal red-ink lines at both the beginning and the end of the special run. In all cases only the actual running time is included in the time interval.

When a shut-down due to brick failure occurs, the brick mason sends an accurate report to the office, giving the number of patches put in, the kind and number of bricks used in each, the distance from the end of kiln to the beginning of the patch, and the length of the patch. The actual hours run from the time of starting after the last brick repair to the time of shutting down for the present one is worked up from the records and the present repair is recorded in color or cross-hatching in the space whose top line represents the end of the nearest 100-hr. interval. The graph may thus be in error 50 hr. run, but this is scarcely noticeable. The actual number of hours run is entered in its proper column for accuracy's sake.

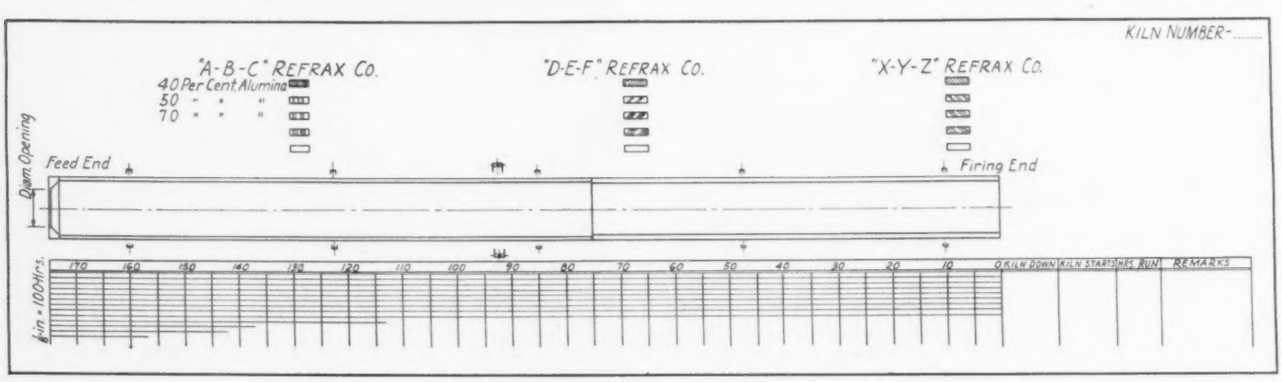



Chart for keeping record of performance of kiln brick.

# MEN OF THE INDUSTRY

W. H. KLEIN

W. H. KLEIN, general operating manager of the Pennsylvania Dixie Cement Corp., Nazareth, Pa., is a graduate of the University of Michigan. He entered the cement industry in 1906 as chemist for the Kansas Portland Cement Co., soon becoming general superintendent. A few years later he joined the Dixie Portland Cement Co. in the same capacity and, when this company was taken over by Pennsylvania-Dixie Cement Corp., became general manager of the Southern Division for the latter organization. On Sept. 1, 1933, Mr. Klein was promoted to his present position. He is also vice-president of a subsidiary, the Dixie Sand & Gravel Corp., a director of the National Sand & Gravel Assn., and a member-at-large of the Code Authority of the mineral-aggregate industries.

# Personal Mention

**C. V. Murray** has been added to the staff of the Patterson Foundry & Machine Co., at its branch in New York City. Mr. Murray formerly represented another company in the New York territory for 13 years.

**Don A. Weber,** general manager of the Deister Concentrator Co., Fort Wayne, Ind., has been elected to the board of directors of the Foundry Equipment Mfrs. Assn., and has also been appointed a member of the Code Authority for this industry.

**Wilbur Newton,** member of the firm of Boettcher & Co., investment bankers of Denver, Colo., was elected to the board of directors of the Ideal Cement Co., at its recent annual meeting. He succeeds James Q. Newton, retired. The other directors were reelected.

**R. W. Winters** succeeds D. W. McGlashon as representative of the Portland Cement Assn. in the Kansas City territory. Mr. McGlashon has been appointed structural engineer for the company.

**Everett Chapman** has been elected vice president of Lukenweld, Inc., division of the Lukens Steel Co., Coatesville, Pa. Mr. Chapman joined this company in 1930 as director of engineering research.

**Edwin L. Grimes,** a well-known sales engineer in the Detroit district, has been appointed district manager for the Patterson Foundry & Machine Co., East Liverpool, O., for its new office in the Basso Bldg., Detroit, Mich. **Louis H. Burkhart, Jr.,** has been appointed to handle territory in northern New York state and western Pennsylvania, and will make his headquarters at Corry, Pa.

**Frederick Andrews** has been appointed general manager of Gypsum, Lime & Alabastine, Canada, Ltd., Paris, Ont. **H. H. Phillips** has been appointed general sales manager. Both have occupied various executive positions with the company for a number of years.

**W. E. Rowe,** formerly local manager of the Hagersville Quarries & Marble Co., Hagersville, Ont., was recently appointed assistant city treasurer of St. Thomas, Ont.

**Col. H. Cockshutt** of Brantford, Ont., was elected president and chairman of the board of directors at a recent meeting of the directors of Gypsum, Lime & Alabastine, Canada, Ltd. **J. E. McConnell** and **W. C. Pitfield** were appointed vice presidents.

**M. Moss Alexander** has been elected president of the Missouri Portland Cement Co., St. Louis, Mo., to succeed the late H. L. Block. He had been vice president and general sales manager for the company and was formerly connected with the Oklahoma Portland Cement Co.

**Ford J. Twaits** has resigned as president and chairman of the board of directors of the Consolidated Rock Products Co., Los Angeles, Cal., a position he has held since 1930. **Frank Gautier,** formerly head of the Consumers Rock & Gravel Co. before its merger with the present company, has been appointed vice president and manager.

**Tom B. Douglas** has resigned as advertising manager of the Dewey Portland Cement Co., Kansas City, Mo., to join the Murrel Crump Advertising Co. as manager of its Kansas City office.

## Obituary

**William W. Beyer,** president of the Beyer Crushed Rock Co., Kansas City, Mo., died recently in that city.

**Robert H. Schmitz,** 42, owner of the Schmitz Cement Block Co., Tiffin, O., died Feb. 6 of a heart attack.

**H. A. Boyer,** 66, owner of the H. A. Boyer Co., sand and gravel producers and cement products manufacturers of Faribault, Minn., died Feb. 4 after a long illness.

**F. C. McColm,** president of the McColm Granite Co., died Feb. 11 at his home in Huntington, W. Va.

**Emil Vollp,** part owner of the Lime Sales Co., Inc., Dallas, Ore., met his death accidentally on Feb. 13.

**Frank R. Dravo,** 67, vice president of the Keystone Sand & Supply Co., Pittsburgh, Pa., was killed in a train wreck in that city on Feb. 26. He was also chairman of the board of the Dravo Corp., and president of the Dravo Contracting Co. Mr. Dravo was a graduate of Lehigh University and organized the Dravo company in 1891.

**G. C. Watling,** owner of the Watling Sand & Gravel Co., Seattle, Wash., died recently.

## Old Utah Idaho Cement Plant May Be Rebuilt

Ashby Snow, president and general manager of the Portland Cement Co. of Utah, Salt Lake City, Utah, recently announced that the plant of the Western Portland Cement Co., near Brigham City, would be repaired and placed in operation as soon as business conditions warrant. This plant, formerly known as the Utah Idaho Cement Co., has not been operated since August, 1931, when the cement storage and crushing departments were damaged by fire. The plant was later taken over by the Western company but was never operated. According to Mr. Snow the plant was purchased by his sons, Erastus P. and Herbert A. Snow, and is in no manner connected with the Portland Cement Co. of Utah.

## Ohio Power Shovel Co. Appoints New Dealers

The Ohio Power Shovel Co., Lima, O., announces the appointment of the Allied Equipment Co., Oklahoma City, Okla., and the Brown-Bevis Equipment Co., Los Angeles, Cal., as distributors for its complete line of shovels, cranes and draglines.

## Mead-Morrison Handling Business Sold to Robins

The Robins Conveying Belt Co., New York, N. Y., has acquired the coal and ore handling business of the Mead-Morrison Mfg. Co., Boston, Mass., to be operated henceforth as a division of the Robins company. This consolidation gives the Robins company a complete line of material-handling machinery. The Mead-Morrison office in New York City has been closed and its personnel moved to the Robins offices. Equipment is now being transferred to the Robins works in Passaic, N. J.

## Morse Chain Co. Buys Kelpo Industrial Clutch

The Kelpo free-wheeling or one-way industrial clutch has been acquired by the Morse Chain Co., Division of Borg-Warner Corp. This clutch has been a product of the Kelpo Clutch Co., of Rockford, Ill. In the future, the Kelpo clutch will be manufactured at the Ithaca plant of the Morse Chain Co. and will be sold by Morse Chain Co. representatives. Fred M. Potgieter, formerly president of Kelpo Clutch Co., has joined the Morse organization.

## Calaveras Cement Co. Making White Cement

The Calaveras Cement Co., San Francisco, Cal., announces that it is now manufacturing Calaveras white Portland cement at its plant at San Andreas, Cal. According to the company this cement is adaptable for many architectural uses where a pure white or true color is required. It can also be used with colored aggregate or pigment and is especially suited for highway markers, etc.

## *Coming Events*

**March 5-9, 1934, Washington, D. C.**—Group meetings of A. S. T. M. committees, Wardman Park Hotel, Washington.

**March 7, 1934, Washington, D. C.**—Regional meeting of the American Society for Testing Materials, Wardman Park Hotel, Washington.

**June 25-29, 1934, Atlantic City, N. J.**—Annual meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City.

# Aggregates Statistics

THE accompanying charts, when published six months ago in PIT AND QUARRY, September, 1933, p. 44-45, with data through June, 1933, reflected a dismal outlook in the industries consuming aggregates and related materials. For the latter half of the year, however, unmistakable indications of improved conditions were apparent. Time alone will prove the permanence of these gains.

A detailed comparison of monthly figures for the several indicators is given in Table I. In comparing the record for 1933 with that of 1932 by means of percentage-change relationships, it is interesting to note that from January to June the year 1933 was characteristically lower than 1932, but from July to December most of the series of data showed appreciable gains in 1933.

▼

By H. H. HUGHES

*Bureau of Mines, Department of Commerce*

*P. W. A. Aids Construction.*—Although construction in 1932 reached levels far below any year since the F. W. Dodge Corp. began collecting statistics, monthly contract awards for nine months of 1933 were even lower. During the last quarter of the year, however, the influence of the public-works program was reflected in a sharp upward trend in value of contracts awarded. This contraseasonal rise resulted in contracts valued at $207,210,000 being awarded in December. Although this represented an increase of 155 per cent. from December, 1932, it was only about 60 per cent. of the December average from 1925 to 1932. Total awards for the year were 7 per cent. less than in 1932. The impetus of the public-works program is expected to result in appreciable increases in contracts awarded during the first half of 1934, after which it is hoped that the tangled credit situation will be relieved sufficiently to attract private capital into construction.

Residential contracts awarded during 1933 lagged behind 1932 for the first four months of the year, forged ahead slightly from May to August, and remained at about the same level for the last four months. The net result was that residential contracts awarded in 1933, in terms of square feet of floor space, were only 1 per cent. less than in 1932. How to revive stagnant residential building is the real problem confronting the construction industry.

**Table I.—INDICATORS OF DEMAND FOR AGGREGATES AND RELATED MATERIALS, 1932-1933(*a*)**

| | January | February | March | April | May | June | July | August | September | October | November | December | 12-Month Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction-Contract Awards (*b*) | | | | | | | | | | | | | |
| 1932 ... *thousands of dollars* | $ 84,798 | $ 89,046 | $112,235 | $121,705 | $146,221 | $113,075 | $128,769 | $133,988 | $127,527 | $107,474 | $105,302 | $ 81,219 | $112,613 |
| 1933 ... *thousands of dollars* | 83,356 | 52,712 | 59,959 | 56,573 | 77,172 | 102,980 | 82,693 | 105,989 | 120,249 | 145,367 | 162,341 | 207,210 | 104,717 |
| Change from 1932 ... *per cent* | −1.7 | −40.8 | −46.6 | −53.5 | −47.2 | −8.9 | −35.8 | −20.9 | −5.7 | +35.3 | +54.2 | +155.1 | −7.0 |
| Residential floor space | | | | | | | | | | | | | |
| 1932 ... *thousands of sq. ft.* | 6,922 | 6,071 | 8,523 | 7,174 | 6,662 | 5,794 | 5,456 | 5,545 | 6,550 | 5,984 | 5,490 | 3,437 | 6,134 |
| 1933 ... *thousands of sq. ft.* | 3,160 | 3,149 | 4,773 | 5,814 | 8,352 | 8,309 | 7,383 | 6,369 | 6,296 | 6,868 | 6,433 | 5,890 | 6,066 |
| Change from 1932 ... *per cent* | −54.3 | −48.1 | −44.0 | −19.0 | +25.4 | +43.4 | +35.3 | +14.9 | − 3.9 | +14.8 | +17.2 | +71.4 | −1.1 |
| Engineering-Construct. Contract Awards (*c*) | | | | | | | | | | | | | |
| 1932 ... *thousands of dollars* | $ 93,581 | $ 85,814 | $ 90,116 | $102,274 | $107,743 | $118,587 | $120,458 | $ 81,634 | $114,487 | $100,812 | $100,443 | $103,360 | $101,609 |
| 1933 ... *thousands of dollars* | 95,392 | 60,513 | 57,934 | 49,393 | 78,198 | 104,200 | 50,368 | 74,063 | 106,677 | 141,622 | 147,446 | 102,563 | 89,031 |
| Change from 1932 ... *per cent* | +1.9 | −29.5 | −35.7 | −51.7 | −27.4 | −12.1 | −58.2 | −9.3 | −6.8 | +40.5 | +46.8 | −0.8 | −12.4 |
| Concrete-Pavement Contract Awards (*d*) | | | | | | | | | | | | | |
| 1932 ... *thousands of sq. yd.* | 2,524 | 3,255 | 6,005 | 11,088 | 10,360 | 11,068 | 7,236 | 12,275 | 12,653 | 6,712 | 8,002 | 5,649 | 8,069 |
| 1933 ... *thousands of sq. yd.* | 5,387 | 1,440 | 1,696 | 570 | 1,902 | 1,861 | 1,428 | 5,650 | 5,764 | 7,970 | 5,542 | 5,918 | 3,761 |
| Change from 1932 ... *per cent* | +113.4 | −55.8 | −71.8 | −94.9 | −81.6 | −83.2 | −80.3 | −54.0 | −54.4 | +18.7 | −30.7 | +4.8 | −53.4 |
| Portland Cement Shipments (*e*) | | | | | | | | | | | | | |
| 1932 ... *thousands of bbls.* | 3,393 | 3,118 | 3,973 | 6,536 | 8,020 | 9,264 | 9,218 | 10,968 | 9,729 | 8,743 | 4,782 | 2,835 | 6,715 |
| 1933 ... *thousands of bbls.* | 2,502 | 2,278 | 3,510 | 4,949 | 6,709 | 7,979 | 8,697 | 5,994 | 6,517 | 6,750 | 4,463 | 3,738 | 5,341 |
| Change from 1932 ... *per cent* | −26.3 | −26.9 | −11.7 | −24.3 | −16.3 | −13.9 | −5.7 | −45.4 | −33.0 | −22.8 | −6.7 | +31.9 | −20.5 |
| Asphalt, Domestic Demand (*f*) | | | | | | | | | | | | | |
| 1932 ... *short tons* | 115,302 | 110,536 | 123,435 | 147,276 | 214,976 | 259,498 | 243,532 | 313,352 | 241,124 | 262,806 | 132,375 | 131,113 | 191,277 |
| 1933 ... *short tons* | 92,091 | 63,625 | 104,505 | 142,990 | 224,517 | 238,834 | 261,684 | 239,263 | 211,309 | 224,181 | 119,055 | 137,092 | 171,596 |
| Change from 1932 ... *per cent* | −20.1 | −42.4 | −15.3 | −2.9 | +4.4 | −8.0 | +7.5 | −23.6 | −12.4 | −14.7 | −10.1 | +4.6 | −10.3 |
| Glass-Containers Production (*g*) | | | | | | | | | | | | | |
| 1932 ... *thousands of gross* | 1,606 | 1,548 | 1,886 | 2,027 | 2,027 | 1,945 | 1,677 | 1,660 | 1,462 | 1,750 | 1,508 | 1,462 | 1,713 |
| 1933 ... *thousands of gross* | 1,636 | 1,585 | 1,704 | 1,568 | 1,693 | 2,007 | 2,322 | 2,492 | 2,158 | 2,237 | 2,123 | 1,997 | 1,960 |
| Change from 1932 ... *per cent* | +1.9 | +2.4 | −9.7 | −22.6 | −16.5 | +3.2 | +38.5 | +50.1 | +47.6 | +27.8 | +40.8 | +36.6 | +14.4 |
| Illuminating-Glassware Production (*h*) | | | | | | | | | | | | | |
| 1932 ... *number of turns* | 1,463 | 1,301 | 1,374 | 1,393 | 1,357 | 1,423 | 1,059 | 885 | 782 | 1,090 | 1,338 | 1,144 | (*i*)1,122 |
| 1933 ... *number of turns* | 795 | 1,010 | 1,008 | 1,161 | 1,484 | 1,670 | 1,611 | 1,647 | 1,926 | 1,713 | 1,588 | ..... | (*i*)1,419 |
| Change from 1932 ... *per cent* | −45.7 | −22.4 | −26.6 | −16.7 | +9.4 | +17.4 | +52.1 | +86.1 | +146.3 | +57.2 | +18.7 | ..... | +26.5 |
| Polished Plate-Glass Production (*j*) | | | | | | | | | | | | | |
| 1932 ... *thousands of sq. ft.* | 5,753 | 6,726 | 4,622 | 5,255 | 3,154 | 5,140 | 2,849 | 1,843 | 3,567 | 4,120 | 4,718 | 4,475 | 4,352 |
| 1933 ... *thousands of sq. ft.* | 6,472 | 5,186 | 5,112 | 4,893 | 8,286 | 9,946 | 11,828 | 11,768 | 9,346 | 6,064 | 4,360 | 6,654 | 7,493 |
| Change from 1932 ... *per cent* | +12.5 | −22.9 | +10.6 | −6.9 | +162.7 | +93.5 | +315.2 | +538.5 | +162.0 | +47.2 | −7.6 | +48.7 | +72.2 |
| Pig-Iron Production (*k*) | | | | | | | | | | | | | |
| 1932 ... *thousands of long tons* | 973 | 964 | 967 | 853 | 784 | 628 | 572 | 531 | 593 | 645 | 631 | 546 | 724 |
| 1933 ... *thousands of long tons* | 569 | 554 | 542 | 624 | 887 | 1,265 | 1,792 | 1,833 | 1,522 | 1,356 | 1,085 | 1,182 | 1,101 |
| Change from 1932 ... *per cent* | −41.5 | −42.5 | −44.0 | −26.8 | +13.1 | +101.4 | +213.3 | +245.2 | +156.7 | +110.2 | +71.9 | +116.5 | +52.1 |
| Malleable-Castings Production (*l*) | | | | | | | | | | | | | |
| 1932 ... *short tons* | 22,216 | 21,578 | 19,597 | 16,758 | 17,430 | 15,143 | 9,703 | 7,038 | 10,168 | 12,586 | 13,912 | 14,128 | 15,021 |
| 1933 ... *short tons* | 12,638 | 13,780 | 9,959 | 18,566 | 24,628 | 31,118 | 30,865 | 31,811 | 27,078 | 24,381 | 21,994 | 21,870 | 22,391 |
| Change from 1932 ... *per cent* | −43.1 | −36.1 | −49.2 | +10.8 | +41.3 | +105.5 | +218.1 | +352.0 | +166.3 | +93.7 | +58.1 | +54.8 | +49.1 |
| Gray-Iron Castings Production (*m*) | | | | | | | | | | | | | |
| 1932 ... *avg. tons per foundry* | 70 | 71 | 69 | 67 | 77 | 65 | 59 | 65 | 78 | 78 | 74 | 66 | 70 |
| 1933 ... *avg. tons per foundry* | 62 | 69 | 65 | 68 | 99 | 122 | (*n*) | (*n*) | (*n*) | (*n*) | (*n*) | (*n*) | ..... |
| Change from 1932 ... *per cent* | −11.4 | −2.8 | −5.8 | +1.5 | +28.6 | +87.7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

(*a*) Data are taken from Survey of Current Business, published by the Bureau of Foreign and Domestic Commerce, Washington, D. C. (*b*) F. W. Dodge Corp. (*c*) *Engineering News-Record.* (*d*) Portland Cement Assn. (*e*) B. W. Bagley, U. S. Bureau of Mines. (*f*) A. H. Redfield, U. S. Bureau of Mines. (*g*) Glass Container Assn. (*h*) Illuminating Glassware Guild. (*i*) 11 months. (*j*) Plate Glass Manufacturers of America, Data are partly estimated. (*k*) *Iron Age.* (*l*) U. S. Bureau of the Census. (*m*) Gray Iron Institute, Inc. (*n*) Series discontinued.

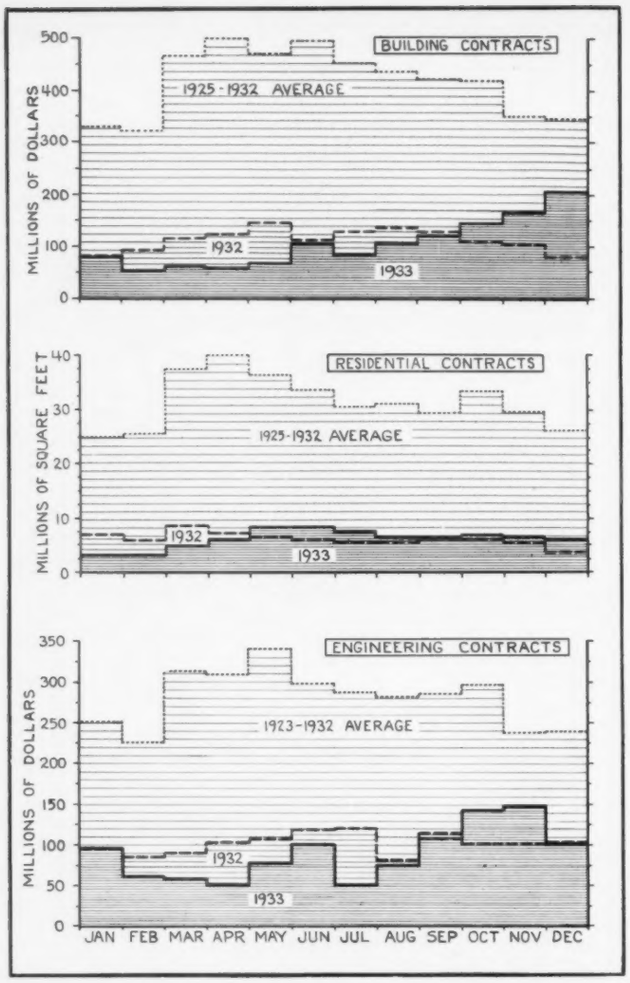



Fig. 1. Building construction in 1932 and 1933 compared with previous experience.

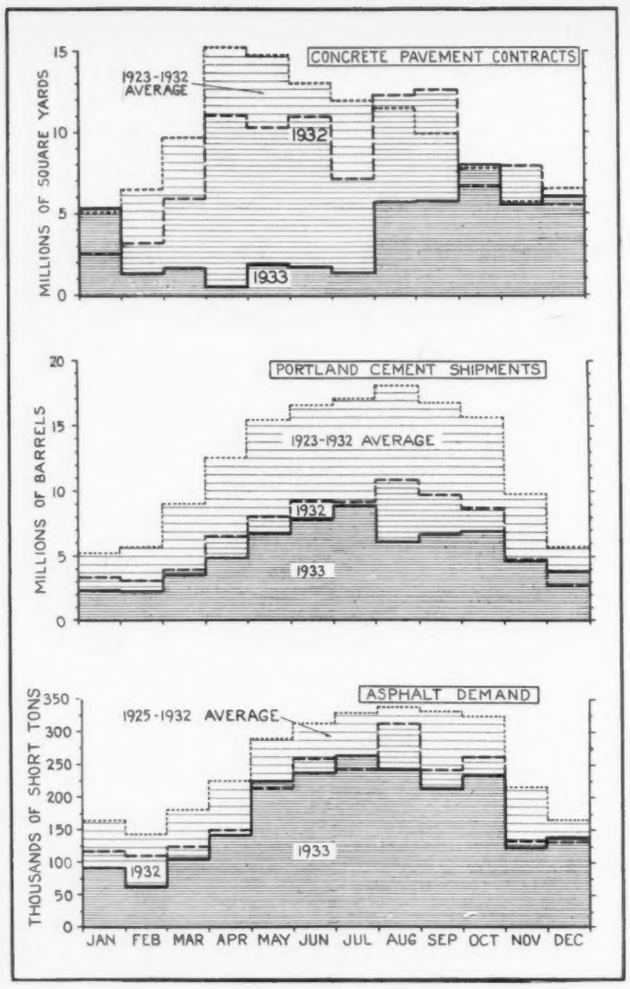



Fig. 2. Highway construction in 1932 and 1933 compared with previous experience.

The value of engineering-construction contracts awarded in 1933 fell below those of 1932 from January to September, but increased sharply in the last quarter. P. W. A. awards, of course, were directly responsible for this upward movement.

*Concrete-Paving Contracts Low.*—After opening 1933 with higher than average awards in January, the volume of concrete-paving contracts awarded for the six months from February to July dropped to only about 10 per cent. of the average for the past 10 yr. This unprecedented low level was followed by substantial increases from August through December, but the total awards for 1933 were 53 per cent. below those of 1932. The awards in April, 1933, normally the peak month, amounted to only 570,000 sq. yd., a decline of 95 per cent. from 11,088,000 sq. yd. in April, 1932, and even this total was appreciably lower than the average April from 1923 to 1932.

These low paving awards in the spring of 1933 were reflected in a drastic drop in cement shipments in August, 1933, the month when shipments normally reach the peak for the year. The total shipments of cement for the year were off 21 per cent. from those of 1932. The outlook for 1934 is considerably better, due principally to P. W. A. expenditures. Although contracts for most of the $400,000,000 allotted to highways were let during 1933, only a small percentage of the actual construction was completed.

The indicated domestic demand for asphalt during 1933 was 10 per cent. lower than in 1932. Shipments of prepared roofing for 11 months of 1933 increased about 5 per cent. over those of 1932. Since asphalt is consumed in both paving and roofing, it is evident that the decrease in the quantity of asphalt used for paving in 1933 was somewhat greater than the decline of 10 per cent. in demand for asphalt to be used for all purposes.

*Glass Industries Active.*—The glass industries apparently were booming during 1933. The production of glass containers, aided no doubt by the return of beer and by prohibition repeal, increased 14 per cent. over that of 1932. Production was only 9 per cent. lower than the yearly average from 1926 to 1932.

The production of illuminating glassware is more directly related to building activity, and even though production for 11 months of 1933 was 27 per cent. higher than in 1932, the total is still far below the average for the past 10 yr.

A midsummer spurt in the automobile industry, which has supplanted building as the principal outlet for plate glass, resulted in an unusually good year for the production of polished plate glass. The output of the industry in 1933 was 72 per cent. higher than in 1932, and production from June through September was higher than the average for the past 10 yr. Only in 1928 and 1929 was July or August production higher than in 1933.

*Pig-Iron Production Higher.*—The production of pig iron early in 1933 was even lower than in 1932, but from May to the end of the year appreciable increases were recorded. The total production for the year was 52 per cent above that of 1932. The production of malleable castings followed a similar trend, with the total output for 1933 49 per cent. more than in 1932. The series of data on gray-iron castings was discontinued during the summer of 1933.

Next month these data will be interpreted in their relation to aggregates production, and, with the aid of railway shipments and other supplementary information, estimates will be made of crushed-stone and sand-and-gravel production in 1933.

See page 51 for Figs. 3 and 4.

# Manufacturers' Publications

*Copies of any of the publications mentioned in this magazine may be had by writing the manufacturers who publish them. Please mention* PIT & QUARRY *when writing.*

**Excavating**

*Lorain 40-30 Shovels.* 8 p. (Catalog, Universal Crane Co., Lorain, O.) Describes and illustrates the new Universal Lorain 40-30, ⅜, ½ and ¾-cu. yd. convertible shovels.

*Tractor Shovel.* 12 p. (Cat. T-8, Bay City Shovels, Inc., Bay City, Mich.) Describes and illustrates the Bay City tractor shovel and the Cranemobile made by this company.

*Convertible Shovel.* 8 p. (Folder No. 1395, Link-Belt Co., Chicago, Ill.) Describes and illustrates the K-55 crawler shovel, crane and dragline which is arranged for gasoline or Diesel engine or electric motor drive.

*Digging Clamshell Buckets.* 12 p. (Bulletin, Jos. F. Kiesler Co., Chicago, Ill.) Describes and illustrates the various sizes of Types D and R digging clamshell buckets.

**Drilling and Blasting**

*Bucyrus-Armstrong Drills.* 4 p. (Bull. No. 26-1. Bucyrus-Erie Co., South Milwaukee, Wis.) Describes and illustrates the Bucyrus-Armstrong "26" blast-hole drill and the bit sharpener of the same make.

*Bucyrus-Armstrong Drills.* 4 p. (Bull. No. 29-1. Bucyrus-Erie Co., South Milwaukee, Wis.) Describes and illustrates the Bucyrus-Armstrong "29" blast-hole drill and the bit sharpener of the same make.

*Portable Furnaces.* 8 p. (Bull. No. 74-D, Sullivan Machinery Co., Chicago, Ill.) Various types of portable drill steel furnaces are described and illustrated.

*Blasting Caps.* (Atlas Powder Co., Wilmington, Del.) Describes and illustrates the new accordion fold electric blasting caps in a handy package.

**Motors and Drives**

*Gearflex Couplings.* 8 p. (Bull. No. 437, Farrel-Birmingham Co., Buffalo, N. Y.) Describes and illustrates the two types of Farrel Gearflex flexible couplings.

*Gear Motors.* 8 p. (Bull. GEA-1437B General Electric Co., Schenectady, N. Y.) Describes the gear motors made by this company and illustrates practical applications in various industries.

*Texsteel Sheaves.* 4 p. (Allis-Chalmers Mfg. Co., Milwaukee, Wis.) Bulletin gives specifications and other data on Texsteel Sheaves for Texrope drives.

**Miscellaneous**

*Mine Cars.* 12 p. (Bull. No. 210, Ottumwa Iron Works, Ottumwa, Ia.) Describes in detail and illustrates the various types and sizes of mine cars made by this company.

*Diesel Tractor.* 8 p. (Bulletin, Cleveland Tractor Co., Cleveland, O.) Describes and illustrates the Cletrac "80" Diesel tractor.

*Wheel Dumptor.* 12 p. (Bulletin, Koehring Co., Milwaukee, Wis.) Describes and illustrates the Koehring Wheel Dumptor which is equipped with pneumatic tires.

*Electric Hoists.* 24 p. (Bull. J-3, Clyde Iron Works, Duluth, Minn.) Illustrates and describes in detail the various sizes of electric hoists made by this company.

*Dust Collector.* 8 p. (Folder, Pangborn Corp., Hagerstown, Md.) Describes and illustrates the new all-metal construction of the Pangborn "CH" dust collector.

*Super Manga Iron.* 4 p. (Bull. No. 87, Robins Conveying Belt Co., New York, N. Y.) Describes the Super Manga abrasion-resisting iron and some of the purposes for which it is used.

**Screening**

*Electric Vibrating Screens.* 12 p. (Bull. No. 579, Jeffrey Mfg. Co., Columbus, O.) Describes and illustrates the various sizes and types of Jeffrey-Traylor electric vibrating screens made by this company.

*Vibrating Screens.* 20 p. (Bull. No. 732, Productive Equipment Co., Chicago, Ill.) Describes in detail the various types of Jigger vibrating screens and the automatic cleaner, fluffer and other devices made for use with them.

*Normal Duty Vibrator.* 4 p. (Folder, Stephens-Adamson Mfg. Co., Aurora, Ill.) Describes and illustrates the Normal Duty Vibrator screen which supplements the heavy-duty screen made by this company.

*Simplicity Gyrating Screens.* 4 P. (Bull. No. 33, Simplicity Engineering Co., Durand, Mich.) Describes the Simplicity gyrating screen and illustrates its application to various purposes.

*Perforated Metal.* 40 p. (Catalogue. Cross Engineering Co., Carbondale, Pa.) Describes the various types and sizes of perforated metal screen cloth made by this company including special types for vibrating screens.

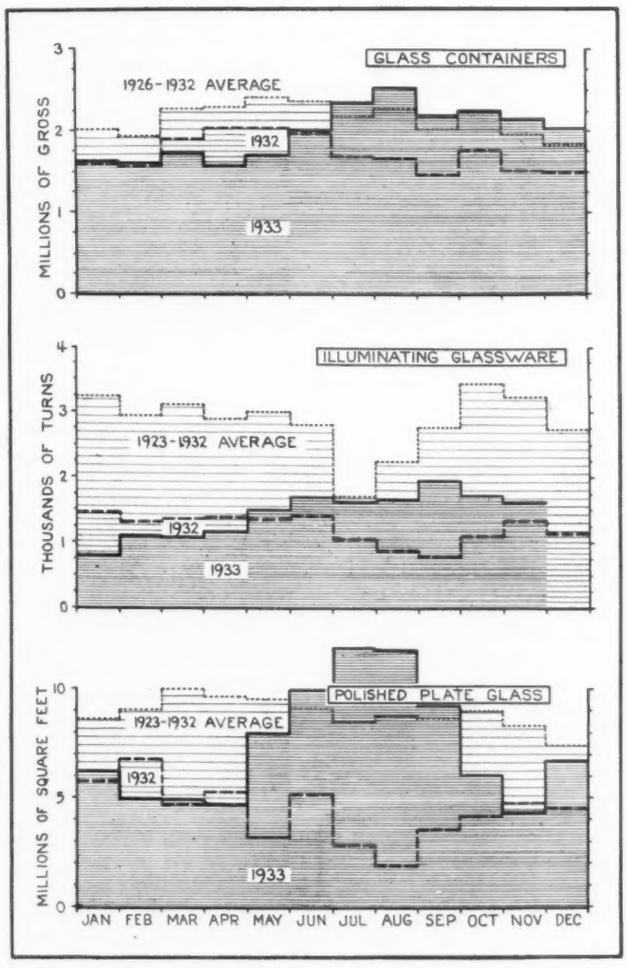



Fig. 3. Glass production in 1932 and 1933 compared with previous experience. Production of polished plate glass indicates demand for grinding and polishing sand as well as glass sand.

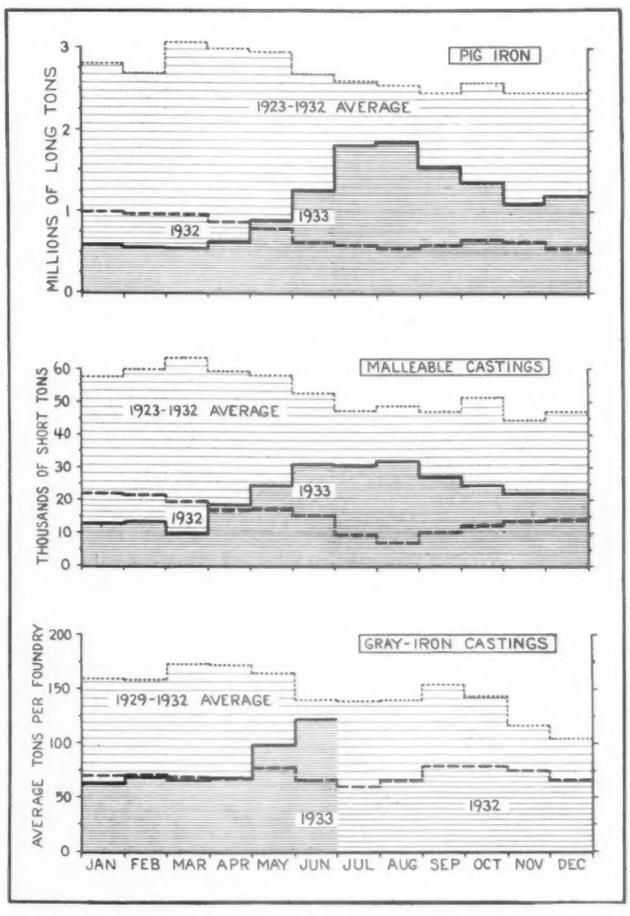



Fig. 4. Indicators of demand for fluxing stone and molding sand in 1932 and 1933 compared with previous experience. Gray iron castings data discontinued in summer of 1933.

# Latest Portland-Cement Statistics

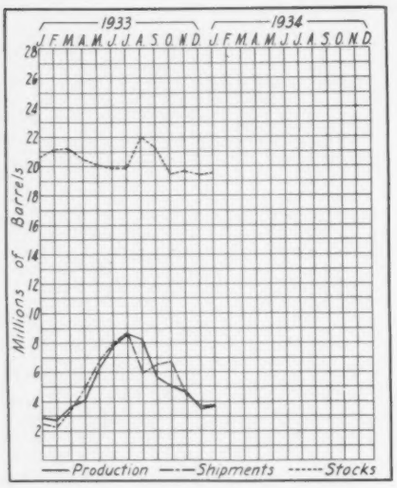



**Chart showing monthly production, shipments and stocks on hand at end of month from January, 1933, to January, 1934.**

THE Portland-cement industry in January, 1934, produced 3,779,000 bbl., shipped 3,778,000 bbl. from the mills, and had in stock at the end of the month 19,541,000 bbl. The production of Portland cement in January, 1934, showed an increase of 27.8 per cent. and shipments an increase of 51.0 per cent., as compared with January, 1933. Portland-cement stocks at the mills were 5.3 per cent. lower than a year ago. The factory value of the shipments from the mills in 1933—64,086,000 bbl.—is estimated as $83,965,000.

In the following statement the total output of cement is compared with the estimated capacity of 163 plants at the close of January, 1934, and of 165 plants at the close of January, 1933.

**RATIO (*per cent.*) OF PRODUCTION TO CAPACITY**

| | January | | Dec. | Nov. | Oct. |
|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1933 | 1933 |
| The month.. | 12.9 | 16.6 | 15.5 | 21.2 | 22.1 |
| The 12 months ended | 27.6 | 23.9 | 23.6 | 23.9 | 24.5 |

**PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1933 AND 1934** (*In thousands of barrels*)

| Month | Production | | Shipments | | Stocks At End of Month | |
|---|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 | 1933 | 1934 |
| January | 2,958 | 3,779 | 2,502 | 3,778 | 20,624 | 19,541 |
| February | 2,777 | ..... | 2,278 | ..... | 21,125 | ..... |
| March | 3,684 | ..... | 3,510 | ..... | 21,298 | ..... |
| April | 4,183 | ..... | 4,949 | ..... | 20,542 | ..... |
| May | 6,262 | ..... | 6,709 | ..... | 20,117 | ..... |
| June | 7,804 | ..... | 7,979 | ..... | 19,936 | ..... |
| July | 8,609 | ..... | 8,697 | ..... | 19,848 | ..... |
| August | 8,223 | ..... | 5,994 | ..... | 22,078 | ..... |
| September | 5,638 | ..... | 6,517 | ..... | 21,216 | ..... |
| October | 5,037 | ..... | 6,750 | ..... | 19,502 | ..... |
| November | 4,672 | ..... | 4,463 | ..... | 19,709 | ..... |
| December | 3,526 | ..... | 3,738 | ..... | *a*19,541 | ..... |
| Totals | 63,373 | ..... | 64,086 | ..... | ..... | ..... |

*a* Revised.

**DISTRIBUTION OF CEMENT** (*a*)

| Shipped to— | November | | December | | Shipped to— | November | | December | |
|---|---|---|---|---|---|---|---|---|---|
| | 1932 | 1933 | 1932*b* | 1933 | | 1932 | 1933 | 1932*b* | 1933 |
| Alabama | 46,722 | 57,406 | 32,487 | 100,482 | New Jersey | 178,586 | 148,810 | 118,506 | 109,049 |
| Alaska | 528 | 396 | 82 | 0 | New Mexico | 12,752 | 14,856 | 7,749 | 16,139 |
| Arizona | 11,747 | 11,354 | 4,237 | 20,199 | New York | 623,446 | 401,337 | 401,481 | 232,319 |
| Arkansas | *b*32,310 | 41,274 | 18,865 | 42,488 | North Carolina | 30,813 | 44,302 | 32,762 | 45,077 |
| California | 368,806 | 418,928 | 310,038 | 373,141 | North Dakota | 3,590 | 2,410 | 2,106 | 3,978 |
| Colorado | 30,044 | 27,782 | 12,716 | 24,420 | Ohio | 248,100 | 168,128 | 143,381 | 140,350 |
| Connecticut | 55,588 | 71,218 | 29,141 | 25,078 | Oklahoma | 119,817 | 104,154 | 52,584 | 100,657 |
| Delaware | 28,807 | 18,440 | 15,299 | 13,800 | Oregon | 19,121 | 19,693 | 12,071 | 19,686 |
| Dist. of Col | 88,796 | 75,016 | 70,833 | 36,781 | Pennsylvania | *b*375,171 | 216,593 | 237,350 | 162,376 |
| Florida | 31,192 | 52,151 | 46,660 | 63,941 | Porto Rico | 6,850 | 7,808 | 8,675 | 11,605 |
| Georgia | 96,639 | 88,522 | 63,730 | 50,585 | Rhode Island | 19,367 | 16,662 | 13,053 | 9,852 |
| Hawaii | 14,050 | 10,745 | 12,323 | 11,989 | South Carolina | 10,783 | 19,739 | 15,889 | 17,848 |
| Idaho | 6,095 | 10,378 | 1,011 | 7,355 | South Dakota | 6,325 | 16,238 | 4,099 | 9,320 |
| Illinois | 272,348 | 267,761 | 98,572 | 302,131 | Tennessee | *b*162,184 | 66,645 | 74,343 | 82,777 |
| Indiana | 76,993 | 119,603 | 40,315 | 94,689 | Texas | 363,185 | 224,131 | 167,779 | 217,494 |
| Iowa | 86,539 | 62,921 | 30,264 | 40,874 | Utah | 20,118 | 23,162 | 5,699 | 7,313 |
| Kansas | 79,749 | 85,377 | 38,911 | 69,184 | Vermont | 7,026 | 10,846 | 3,397 | 3,461 |
| Kentucky | *b*88,949 | 89,705 | 41,887 | 73,566 | Virginia | 57,857 | 64,199 | 55,167 | 68,082 |
| Louisiana | 108,552 | 85,479 | 64,404 | 96,860 | Washington | 45,327 | 53,916 | 19,988 | 36,412 |
| Maine | 15,169 | 12,816 | 12,436 | 6,692 | West Virginia | 43,485 | 45,933 | 49,327 | 42,747 |
| Maryland | 101,789 | 70,027 | 75,044 | 64,611 | Wisconsin | 87,968 | 75,277 | 35,093 | 64,003 |
| Massachusetts | 132,313 | 106,951 | 84,422 | 70,212 | Wyoming | 6,011 | 7,166 | 3,201 | 6,348 |
| Michigan | 94,471 | 106,952 | 35,907 | 120,573 | Unspecified | *b* 0 | 87,316 | 0 | 24,624 |
| Minnesota | 35,044 | 51,638 | 24,340 | 36,845 | | 4,732,008 | 4,418,776 | 2,807,573 | 3,653,348 |
| Mississippi | *b*79,075 | 63,345 | 40,792 | 49,759 | Foreign countries | 49,992 | 44,224 | 27,427 | 84,652 |
| Missouri | *b*158,669 | 299,324 | 90,626 | 157,835 | | | | | |
| Montana | 5,997 | 11,216 | 4,211 | 10,743 | Total shipped from cement plants | 4,782,000 | 4,463,000 | 2,835,000 | 3,738,000 |
| Nebraska | 49,924 | 56,758 | 12,014 | 22,509 | | | | | |
| Nevada | 61,177 | 187,182 | 27,316 | 227,041 | | | | | |
| New Hampshire | 26,044 | 18,790 | 4,630 | 7,448 | | | | | |

*a* Includes estimated distribution of shipments from two plants in December, 1933; from three plants in November, 1933, and in November and December, 1932.
*b* Revised.

## Bodinson Machinery Co. Moves Office and Plant

The Bodinson Machinery Co., San Francisco, Cal., announces that it has removed its general office and plant to 4401 San Bruno Ave., where enlarged space and improved facilities are available.

## A.S.T.M. Announces 1933 Tentative Standards Book

The American Society for Testing Materials announces that the 1933 edition of the Book of A. S. T. M. Tentative Standards is now available and can be obtained at its headquarters at 260 South Broad St., Philadelphia, Pa. This book contains all of the tentative specifications, methods of test and definitions of terms issued by the Society. A total of 223 standards are included, 47 of which are being published for the first time, while 41 are revised from the previous publication. Included are some 45 items on cement, gypsum, lime, refractories, concrete and masonry materials and others of interest to non-metallic mineral producers.

## Jeffrey Mfg. Co. Appoints Two Ohio Distributors

The Jeffrey Mfg. Co., Columbus, O., has opened offices in the Carew Tower Bldg., Cincinnati, O., and in the Rockefeller Bldg., Cleveland, O. Their representative at Cincinnati is Lyle Martin and at Cleveland, G. D. Francisco and J. R. Warren.

The Iowa Mfg. Co., Cedar Rapids, Ia., has appointed the Peden Equipment Co., Cleveland, O., as its representative in that territory.

The Chain Belt Co., Milwaukee, Wis., announces the appointment of Dale & Rankin, Inc., Newark, N. J., as distributors for their line of Rex construction equipment.

## Gypsum, Lime & Alabastine Opens Plant in England

The Gypsum, Lime and Alabastine, Canada, Ltd., with head office in Paris, Ont., and plants in various centers in the provinces has erected a plant in England to provide an outlet for its products which are already well known in that country. The new subsidiary which is known as Gyproc Products, Ltd., with its head office in London, is capitalized at nearly half a million dollars of which more than half is to be sold to the public. Gypsum Products, Ltd., is to supervise manufacturing operations and for these services will receive a yearly management fee of 1,500 lbs. free of income tax.

The Diamond Iron Works, Inc., Minneapolis, Minn., has appointed Kellogg and Tree, New York City, as its exclusive sales agents in the New England States, New York and New Jersey.

# Traffic News and Comment

## Examiners Reports

*Crushed Stone.*—Examiner W. H. Smith proposes that the Commission dismiss the complaint seeking reparation on interstate shipments of crushed stone between points in Missouri found precluded by Arizona Grocery Co. *v.* A. T. & S. F., 284 U. S. 370. Shipments were from Sugar Creek, Mo., and moved between Aug. 1, 1930, and Oct. 12, 1931.—I. C. C. Docket No. 25,743, State Highway Commission of Missouri *v.* A. T. & S. F. *et al.*

*Sand.*—Two mileage scales are proposed by Examiners Burton Fuller and Philip S. Peyser to apply on industrial sand in official territory. Scale A is to apply on ground or pulverized sand and Scale B on core sand from New England and on naturally-bonded molding sand from New York, New Jersey and Ohio districts for all distances in both open-top and box cars. Scale B is also to apply on silica sand and the so-called border-line sands in closed equipment for all distances, and in open equipment for distances over 300 mi. Rates at various points on these scales are:

| Miles | Scale A | Scale B |
|---|---|---|
| 10 | $1.00 | $0.90 |
| 100 | 1.90 | 1.40 |
| 200 | 2.40 | 1.80 |
| 300 | 2.80 | 2.20 |
| 400 | 3.20 | 2.60 |
| 520 | 3.70 | 3.00 |
| 700 | 4.50 | 3.50 |
| 1,020 | 5.20 | 4.30 |
| 1,260 | 6.40 | 4.90 |
| 1,500 | 7.00 | 5.50 |

The examiners suggested the addition of arbitraries for the haul or part of the haul in New England of 30 c. for 50 mi. and under; 35 c. for hauls from 50 to 100 mi.; 40 c. for from 100 to 160 mi.; 45 c. for from 160 to 220 mi.; and 50 c. for distances over 220 mi. On traffic moving to destinations on Long Island the customary sixth-class arbitraries are suggested. On traffic moving between points in New York, New Jersey and New England through New York Harbor an arbitrary of not to exceed 70 c. for movement through the harbor is recommended. The descriptions in the tariffs covering core sand, naturally-bonded molding sand, and silica sand should include the descriptive adjectives, but the so-called border-line sands should be described simply as sand without any qualifying adjectives. The rates on these border-line sands, also on gravel from Phalanx, O., in open-top equipment for distances of 300 mi. and less are to be made as follows: (1) From origins east of a north-and-south line drawn through Cumberland, Md., for distances of 200 mi. and less, on the basis prescribed in Cumberland Cement & Sand Co. *v.* B. & O., 151 I. C. C. 183; (2) from origins west of that line, for distances of 200 mi. and less, rates to destinations in Indiana, Wisconsin, Illinois and Michigan are to be made on the basis of 80 per cent. of Scale B, to destinations in Ohio on the basis prescribed in Rates on Crushed Stone, Gravel, Sand and Slag, 191 I. C. C. 206, and to other destinations on the basis prescribed in Pennsylvania Sand and Gravel Producers Assn. *v.* B. & O., 104 I. C. C. 717 and (3) rates for distances of from 201 to 300 mi., inclusive, on a so-called buffer scale grading into Scale B which provides the following rates: $1.70 for from 201 to 225 mi.; $1.85 for from 226 to 250 mi.; $2.00 for from 251 to 275 mi.; and $2.15 for from 276 to 300 mi. Except on silica sand and tripoli, distances of 300 mi. and less are to be computed in the manner prescribed in the West Penn case, 104 I. C. C. 717, referred to above, and distances over 300 mi. are to be computed by using the shortest route over which car-load traffic can be moved without transfer of lading; provided, that, where the distance on the West Penn formula is over 300 mi. and the distance on the short-line formula is under 300 mi., the rates prescribed shall be those for distances of from 301 to 325 mi. The carload minimum weight on silica sand and tripoli is to be 60,000 lb., and on the other commodities is to be 90 per cent. of the marked capacity of the car except that, when the car is loaded to its full cubical or visible capacity, the actual weight shall apply. The examiners propose that the interstate rates from the Ottawa, Ill., district to the Chicago district be found not unreasonable. Rates in dockets Nos. 24,309, 25,813 and 25,843 should be found unreasonable to the extent that they exceeded $3 from Avery, O., to Beaver Dam, Wis., via Chicago, Ill.; $2.20 from Mapleton, Pa., to Corning, N. Y.; $3.65 from Mapleton, Pa., to Valley Falls, R. I.; and $1.80 from Newport, N. J., to Port Carbon, Pa.; and reparation should be awarded on these findings. On other traffic on which the rates were assailed as unreasonable, reasonable maximum rates for the future will be made by the use of the scales proposed above. This proceeding was heard with the commissions of the states of Pennsylvania and Indiana. The title case is No. 22,907, Industrial Sand Cases, 1934, and with it is joined the cases reported in Industrial Sand Cases, 1930, 188 I. C. C. 99, together with further hearings on Nos. 21,136, 21,553, 23,575, 23,097, 23,382 and 21,618. Five new cases joined with these are No. 24,309, Malleable Iron Range Co. *v.* C. M. St. P. & P. *et al.*; No. 25,587, Virginia Glass Sand Corp. *v.* A. C. & Y. *et al.*; No. 25,639, Illinois Silica Sand Traffic Bureau *v.* A. & W.; No. 25,897, Akron Chamber of Commerce on behalf of the Columbia Silica Co. *v.* A. C. & Y. *et al.*; and No. 26,025, Philadelphia and Reading Coal & Iron Co. *v.* Atlantic City R. R. Co. *et al.* The findings in cases previously decided should be modified to conform to these proposals where they are inconsistent. Previous findings are reported in 109 I. C. C. 346; 115 I. C. C. 322; 120 I. C. C. 43; 147 I. C. C. 615; 147 I. C. C. 691; 152 I. C. C. 749; 153 I. C. C. 469; 153 I. C. C. 721; 153 I. C. C. 734; 155 I. C. C. 301; 155 I. C. C. 687; 188 I. C. C. 99; and 190 I. C. C. 147.

Examiner A. S. Worthington proposes that the Commission award reparation on finding that the rate on sand from Hawarden, Ia., to Canton, S. D., was unreasonable to the extent that it exceeded 70 c. per net ton.—I. C. C. Docket No. 25,675, Booth & Olson, Inc. *v.* C. M. St. P. & P.

*Sand and Gravel.*—Examiner Edgar Snider proposes that the Commission find the rates on sand and gravel from Hawarden, Ia., to various destinations in Nebraska not unduly prejudicial, and dismiss the complaint in I. C. C. Docket No. 26,138, L. G. Everist, Inc. *v.* C. & N. W. *et al.*

Examiner R. G. Taylor recommends that the rates on sand and gravel from Oreapolis, Neb., to Afton and Thayer, Ia., be found not unreasonable, and that the complaint be dismissed in I. C. C. Docket No. 25,922, Capital Construction Co. *v.* C. B. & Q.

Examiner John Davey proposes an award of reparation on finding that the rate on sand and gravel from Machias, N. Y., to Bradford, Pa., was unreasonable to the extent that it exceeded $1 per net ton on shipments moving between Aug. 7 and Oct. 22, 1930.—I. C. C. Docket No. 26,094, McHugh Bros. *v.* Pennsylvania *et al.*

## New Complaints Filed

*Agricultural Limestone.*—An allegation of violation of Sec. 1, 3 and 13 in connection with the rates on agricultural limestone from Bonne Terre and Mosher, Mo., to destinations in Illinois on and south of the Terre Haute-St. Louis line of the Pennsylvania, with shippers in Illinois preferred, is made in a complaint filed by Walter G. Patton, T. M., St. Joseph Lead Co., 250 Park Ave., New York City, J. E. Bouchard, A. T. M., St. Joseph Lead Co., Bonne Terre, Mo., and C. J. Knapp, T. M. Mississippi Lime & Material Co., P. O. Box 247, Alton, Ill.—I. C. C. Docket No. 26,260, Sub. No. 1. St. Joseph Lead Co. *et al v.* B. & O. *et al.*

*Cement.*—Unreasonable and unduly-prejudicial rates on cement from Rapid City, S. D., to Glasgow and Wiota (Ft. Peck Dam), Mont., and intermediate stations on the G. N. west of Ft. Buford, N. D., with shippers at Mason City, Ia., and Steelton, Minn., unduly preferred, are alleged.—I. C. C. Docket No. 26,383, State Cement Commission of South Dakota, Rapid City, S. D. *v.* G. N. *et al.*

*Crushed Stone.*—Reparation is sought on an allegation of a violation of Sec. 1 in connection with the rate on crushed stone from Boxley, Va., to Bowers, Va., via an interestate route.—I. C. C. Docket No. 26,348, Robert G. Lassiter & Co., Raleigh, N. C. *v.* A. C. L. *et al.*

*Sand.*—Reparation is asked for and an unreasonable rate on ground glass sand alleged from Mapleton, Pa., to Hartford, Conn.—I. C. C. Docket No. 26,376, Hartford Faience Co., Hartford, Conn. *v.* N. Y. N. H. & H. *et al.*

## Rate-Committee Dockets

### New England Freight Assn.

*Agricultural Lime and Limestone.*—To assist the potato growers of Aroostook County by the publication of reduced rates on this material which is needed immediately as a soil corrective, shippers propose reductions in the rates on agricultural lime, carload minimum weight 60,000 lb., and on broken and ground unburned limestone, carload minimum weight 50,000 lb. A statement of present and proposed rates will be furnished on request.—Docket No. 32,087.

*Lime and Mortar.*—Shippers are asking for reductions in the rates on lime and dry building mortar, carload minimum weight 50,000 lb., from Winooski, Vt., to West Chester Ave., and Port Morris, N. Y., from 16 c. to 14 c., and from New Haven, Vt., to the same destinations from 14 c. to 12 c. —Docket No. 32,105.

### Trunk Line Assn.

*Cement.*—A reduction in the rate on cement, carload minimum weight 50,000 lb., from Lehigh district, Pa., to Weir Branch, Mass., from 19 c. to 18½ c. per 100 lb., is sought by shippers.—Docket No. 32,011.

*Crushed Stone.*—Shippers propose the following rates on coated crushed stone, from Bedford Hills, N. Y.: To Old Chatham, N. Y., to Brainard, N. Y., $1.55; Adams Crossing, N. Y., to Lebanon Springs, N. Y., $1.60; Stephentown, N. Y., to Cherryplain, N. Y., $1.65; Center Berlin, N. Y., to Petersburg Jct., N. Y., $1.70; White Creek, N. Y., to Sunderland, Vt., $1.80; Manchester, Vt., to North Dorset, Vt., $1.85; Danby, Vt., to Clarendon, Vt., $1.90; Rutland, Vt., $1.95.—Docket No. 32,007.

A rate of $1.30 per ton on uncoated crushed stone from Oriskany Falls, N. Y., to Marcellus, N. Y., and $1.40 per ton on coated stone, is proposed by shippers.—Docket No. 32,019.

*Fluxing Stone.*—A reduction in the rate on fluxing stone from Thomasville, Pa., to Weirton, W. Va., from $1.41 to $1.26 per gross ton is proposed by shippers.—Docket No. 32,033.

Carriers propose to revise the rates on crude and/or fluxing limestone and raw dolomite between specific points in Trunk-

Line territory on the basis of a 16⅔-per cent. reduction, except from the Lebanon Valley district of Pennsylvania to Bethlehem, Swedeland, Conshohocken and Phoenixville, Pa., the reduction to be 24 per cent. and from the Lebanon Valley district to the Lehigh Cement region the reduction to be 20 per cent. A statement of proposed rates will be furnished upon request.—Docket No. M-3,298.

*Roasted Dolomite.*—The following rates on roasted dolomite,[1] from Millville, W. Va., are proposed by shippers: To Atlanta, Ga., $4.67; to Alabama City, Ala., $5.16; to Birmingham and Woodward, Ala., $5.28 per net ton.—Docket No. 32,022.

Carriers propose a rate on roasted dolomite from Millville, W. Va., to Cortland, N. Y., of $2.44 per net ton.—Docket No. 31,714.

**Central Freight Assn.**

*Amiesite.*—A reduction in the rate on coated crushed stone from Utica, N. Y., to Parksville and Liberty, N. Y., from $1.70 to $1.50 per net ton is proposed by shippers.—Docket No. 31,955.

Shippers are asking for a reduction in the rate on coated crushed stone from Wertz, Pa., to Irwin, Pa., from $1.50 to $1.33 per net ton.—Docket No. 31,956.

*Cement.*—Carriers propose to establish rates on cement, car-load minimum weight 50,000 lb., to Baden, Pa., from Neville Island and Wampum, Pa., 7 c. and from New Castle, Pa., 7½c. per 100 lb.—Docket No. 31,960.

Reductions in the rates on cement, car-load minimum weight 50,000 lb., from Henderson Ky., to Cincinnati, O., Covington and Newport, Ky., from 26 c. to 15½ c. and to Louisville, Ky., from 18 c. to 13c. are proposed by carriers.—Docket No. 38,683.

*Crushed Stone.*—Shippers at Spore, O., are asking for the establishment of the following rates to destinations in West Virginia: Hewlet and Wayne, $1.90; Cotton Hill, Kermit and Doane, $2.00; Quinnemont, Naugatuck, Matewan, $2.10; Hinton, and Panther, $2.20; Welch, $2.30; Ronceverte and White Sulphur Springs $2.40 per net ton.—Docket No. 38,678.

Carriers propose to restrict the rates on crushed stone and related articles applying from Chicago district stations to Ohio River Crossings, Brookport, Cairo, Joppa, Metropolis Jeffersonville, New Albany, Ind., Louisville and Paducah, Ky., and Cincinnati, O., also points in Illinois and Indiana, to apply only on shipments transported in open-top cars.—Docket No. 38,789.

*Fluxing Stone.*—Shippers are asking for the establishment of a rate on fluxing limestone, in open-top cars, from Annandale, Branchton, Harrisville and Osbornes, Pa., to Franklin and Oil City, Pa., on the Erie R. R. of $1.13 per gross ton.—Docket No. 38,804.

*Lime.*—Shippers at Marblehead, O., propose a rate on lime, car-load minimum weight 50,000 lb., to Sandusky, O., of 6 c. per 100 lb., to alternate with the present rate of 7½ c., car-load minimum weight 30,000 lb.—Docket No. 38,742.

Shippers are asking that the rates on lime, from points in C. F. A. territory shown in C. F. A. Tariff 218 to Chesapeake Beach Ry. stations, be made by adding 7½ c. to the rates to Baltimore, Md., providing minimum through rates to Chaney, Owings, Mt. Harmony and Chesapeake Beach, Md., of 29½ c. per 100 lb.—Docket No. 38,837.

*Sand.*—A rate on refuse foundry sand, car-load minimum weight 50,000 lb., from Muncie, Ind., to Cincinnati, of $1.35 per net ton is proposed by shippers.—Docket No. 38,679.

*Sand and Gravel.*—Shippers propose a line of rates on common sand and gravel, in box-cars, from Toledo, O., to destinations in Michigan, representative of which are: Almont, $1.65; Baldwin, $2.10; Charlotte, $1.50; Fairfax, $1.50; Howell, $1.25.—Docket No. 38,684.

**Illinois Freight Assn.**

*Agricultural Limestone.*—It is proposed to reduce the rate on agricultural limestone, car-load minimum weight 60,000 lbs., from Marblehead, Ill., to Brokaw, Ill., from $1.59 to $1.30 per net ton.—Docket No. 7,682.

*Crushed Stone.*—A rate of $1.01 per net ton is proposed to apply on crushed stone and agricultural limestone from Pontiac, Ill., to Effner, Eureka, Gilman and Peoria, Ill.—Docket No. 5,792-S-1.

*Plaster.*—It is proposed to establish on plaster and related articles from E. St. Louis, Ill., and St. Louis, Mo., to Cairo, Ill., via all routes a rate of 9½ c., car-load minimum weight, 40,000 lb.—Docket No. 7,692.

**Western Trunk Lines Committee**

*Crushed Stone.*—A reduction in the rate on crushed stone[1], from Spencer, S. D., to Crete, Neb., to 12 c. per 100 lb., has been proposed.—Docket No. 1,055-B.

It is is proposed to establish a rate on crushed stone[1], from Sioux Falls and Spencer, S. D., to Osceola, Neb., of 13½ c. per 100 lb.—Docket No. 2,051-RR.

A reduction in the rate on crushed stone, car-load minimum weight capacity of car, from Ely, Minn., to South Bend, Ind., from $4.21 to $3.33 per ton has been proposed.—Docket No. 2,292-L.

*Plaster.*—Shippers propose the establishment on plaster and related articles, including gypsum filler and ground gypsum, car-load minimum weight 40,000 lb., from Medicine Lodge, Blue Rapids and Irving, Kan., to C. F. A., E. T. L. and N. E. F. A. territories, of rates based on I. C. C. 12,704 scale, plus 25 per cent., with a maximum plussage of 5 c., from the above origins to key points as defined in App. 1 of 164 I. C. C. 1, using the same grouping as shown in B. T. Jones' Tariffs 491 and 492 series. Rates are to be constructed by using the shortest distance over which car-load traffic can be handled without transfer of loading from Blue Rapids, Kan.—Docket No. 6,611-E.

**Southern Freight Assn.**

*Cement.*—It is proposed to revise the rates on cement from the origins named in Agent Speiden's I. C. C. No. 1,582 to Ashton, Gauley Bridge, Harris Ferry, Mason City, Point Pleasant, Ravenswood, Ripley and Spencer, W. Va., to reflect the mileage scale prescribed by the Commission in I. C. C. Docket No. 15,806.—Docket No. 4,103.

Shippers at Gulfport, Miss., propose a revision in the rates on cement to destinations on the N. O. & N. E. A statement of proposed rates will be furnished on request.—Docket No. 4,124.

Shippers at Kosmosdale, Ky., propose a rate on cement to Wabash, Boyd Park and Peru, Ind., of 13 c. per 100 lb.—Docket No. 4,137.

*Ground Limestone.*—The following reduced rates per net ton have been proposed to apply on ground or pulverized limestone, car-load minimum weight 80,000 lb., from Gugan, Ky.: To Chicago, Ill., $3.10; to Detroit, Mich., $3.30; to Jersey City, N. J.—Docket No. 4,154.

*Lime.*—Shippers propose the establishment of reduced rates on lime, car-load minimum weight 30,000 lb., to (M) Mobile, Ala., and to (N) New Orleans, La., for export in Docket No. 4,102, as follows:

| From | To (M) | (N) |
|---|---|---|
| Calera, Ala. | $2.14 | $2.42 |
| Denie, Ala. | 2.50 | 2.50 |
| Newala, Ala. | 2.14 | 2.42 |
| Roberta, Ala. | 2.14 | 2.42 |

A reduction in the rates on lime from Sherwood, Tenn., to West Carrollton, O., to $4.00 per net ton, car-load minimum weight 30,000 lb., and $3.20 per ton, car-load minimum weight 50,000 lb., has been proposed.—Docket No. 4,250.

*Mortar.*—Carriers propose to amend intraterritorial and interterritorial tariffs covering rates on cement to, from, and between points in the South to provide for application of cement rates and minimum weights on mortar (building, dry). Also to provide in connection therewith a mixed-carload rule reading: "Mixed car-loads, of cement, lime and/or mortar (building, dry), will be subject to the highest car-load minimum weight (see Note 1) applicable on any commodity included in the mixture. The car-load rate will be charged on the actual weight of each commodity and the deficit, if necessary to make up the required minimum weight, will be charged for at the highest rates assessed on any of the commodities included in the mixture. In no case shall the total charge on any shipment be less than the highest minimum car-load charge on any article contained in the shipment when in straight car-loads." "Note 1—Where alternative rates and minimum weights apply on lime, the charge for the weight of lime in mixed car-loads shall be obtained by use of the rate applicable thereon at the lowest minimum, except that the charge for the lime shall not exceed that which would be assessed if taken as a straight car-load."—Docket No. 4,071.

**Southwestern Freight Bureau**

*Cement.*—Carriers propose to allow 55 lb. per grain door on such doors used in bulk cars of cement.—Docket No. 2,917.

*Gypsum.*—Shippers request the addition of gypsum filler and ground gypsum to plaster description in S. W. L. Tariffs 219 and 166, also to tariff being issued providing rates from Kansas to W. T. L. territory on plaster.—Docket No. 2,889.

*Sand.*—Shippers propose a reduction in the rate on silica sand, pumice and volcanic ash from Porter and Tullahassee, Okla., to Chicago, Ill., Madison, Wis., and Milwaukee, Wis., from 35 c. to 23 c. per 100 lbs.—Docket No. 2,934.

**Texas-Louisiana Tariff Bureau**

*Sand.*—Shippers propose a rate on sand from Fredericksburg and Pedernales, Tex., to San Antonio, Tex., for T. & N. O. delivery only, of 68 c. per net ton.—Docket No. 8,177-4-TX.

[1] The car-load minimum weight will be 90 per cent of the marked capacity of the car, except that, when the car is loaded to its full cubical or visible capacity, the actual weight will apply.

## Ground Limestone Rates Are Lowered in Ontario

Arrangements have been completed between the Federal and the Provincial governments and the railways for the continuance of the reduced freight rate on limestone used for agricultural purposes in and around Simcoe, Ont. The Ontario Dept. of Agriculture office announces that the freight rates on ground limestone purchased by farmers will be reduced to less than one-half the regular freight rate. Where the present freight tariff is $1.00 per ton the rate to the farmer under the new policy will be 40 c. per ton, the railway reducing its tariff 20 c. per ton and the Government paying 40 c. per ton. The soil on many farms in Norfolk County in which Simcoe is situated are of light soil and if a good stand of alfalfa and clover is required it is necessary to lime the fields.

## Ingersoll-Rand Acquires Turbo-Blower Business

The Ingersoll-Rand Co., Phillipsburg, N. J., has acquired the turbo-blower business of the General Electric Co. and will consolidate it with its own Turbo-Blower Dept. The equipment formerly used by General Electric is being moved to the Ingersoll-Rand plant where all types and sizes will be manufactured.

# Correspondence

## Kühl's "Correct Lime-Content Formula"

TO THE EDITOR:

In the November and December, 1933, numbers of this magazine (pp. 33 and 11, respectively), Arthur J. Pool discusses my formula for the lime standard of Portland cements (PIT AND QUARRY, March, 1933, p. 36).

Among Pool's statements it was especially interesting to me that the practical determination of 3.33 per cent. of free lime in an overlimed clinker corresponded very well with the calculated amount of 3.6 per cent. of lime according to my formula. Although Pool in a second note calls this disclosure inconsistent with the purpose of his article, it still appears to me very important that my formula, derived from years of practical experience, corroborated by Spohn and Solacolu in laboratory research and supported by L. A. Dahl from scientific considerations in connection with Rankin's diagram, has also proved itself in practical test by Pool.

Pool's comments on the application of my formula for the calculation of the "correct" lime content in underlimed and overlimed cements are correct, but they go a bit beyond the purpose that guided me in the construction of my formula. My formula is intended first and foremost to meet two needs:

(1) It should state whether in a finished clinker the lime content is "correct" (or too high or too low);

(2) It should be an indicator for the manufacturer in the selection of the "correct" lime content in making up the raw mix.

It would have been more in line with my ideas if Pool had calculated the lime standard "as such" for his two cement analyses and not a "corrected cement analysis"; he would have found for his two cements:

| | | Underlimed Clinker | Overlimed Clinker |
|---|---|---|---|
| L. St. = | 100 Actual Lime / Standard Lime | 64.4 / 73.0 = 88 | 69.3 / 61.9 = 112 |

These two figures are the characteristics of the two cements; they show that the first cement is considerably too low, the second much too high in lime, and that both cements depart in about the same extent (12 per cent.) from the ideal lime standard.

Obviously, it can also be of some interest for the cement worker to compute the analysis for a cement if an incorrect lime content is corrected with the aid of my standard formula. In that case we must make exactly the same calculation that Pool has set forth; in fact, Hess called attention to this (*Zement* 1931, p. 28) when I published my formula for lime satiation in Germany (*Tonindustrie-Zeitung* 1930, p. 391). At that time I showed (*Zement* 1931, p. 123) that it is of no consequence whether the characteristic I proposed be computed directly from an analysis at hand or whether the computation be made on the basis of a corrected analysis as proposed by Hess (or Pool).

After all, however, I must say that I see the principal value of my formula in its application to the preparation of the cement raw mix. Naturally the cement manufacturer is much less interested in how to evaluate the lime content of a *completed and unalterable* clinker he has made than in what composition he should give his raw mix—that is, the clinker *in the making*. This question is answered by the formula of the lime standard; if $X$ represents the quantity of limestone to be used for 1 part of clay, we get a cement with lime standard 100 if we compute $X$ by the following formula:

$$X = \frac{2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3 - CaO \text{ (for clay)}}{2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3 - CaO \text{ (for limestone)}}$$

This raw mix contains the highest quantity of lime which can be combined in the ideal plant operation. However, it must not be forgotten that such empirically-derived formulas acquire no absolute significance, and that a certain degree of uncertainty attaches to them; differences in the burning temperature, the presence of fluxes, incomplete preparation of the raw materials and many other things can make a cement plant able to attain, not lime standard 100, but only 98 or 95. If this is the case, the attainable maximum of the lime standard, *L. St.*, must be taken into consideration and the computation of $X$ be based on the following formula:

$$X = \frac{\text{L. St. } (2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3) - 100\ CaO \text{ (for clay)}}{\text{L. St. } (2.8SiO_2 + 1.1Al_2O_3 + 0.7Fe_2O_3) - 100\ CaO \text{ (for limestone)}}$$

For cement manufacturers who burn their clinker with gas or oil these formulas need no further correction; but if coal with any ash content is used for burning the cement, the proportion of ash going into the clinker must be computed with the argillaceous components of the raw meal.

HANS KÜHL.

### Reply to Dr. Kühl's Comments

TO THE EDITOR:

Apparently Dr. Kühl does not recognize the statement in my article in regard to the theoretical free lime to be in error. This error was admitted and corrected. (PIT AND QUARRY, December, 1933, p. 11) and was noted by Dr. Kühl; yet it seems, Dr. Kühl would have it appear that the erroneous statement supports his standard formula. However it does not support his formula, as Dr. Kühl can ascertain for himself if he will take the trouble to check the calculation for the amount of theoretical free lime. Perhaps if he would do this he might wish to agree with me that the statement is inconsistent with the purpose of the article.

Had the statement in regard to the amount of theoretical free lime been correct, this single, unconfirmed observation would at best be considered questionable support of Dr. Kühl's formula. I neither oppose nor support the formula and it was not the purpose of my article to do either. I consider my application of the formula in my particular work to be preferable, inasmuch as it tells one the decrease or increase in percentage of lime necessary to bring the clinker analysis into agreement with the formula.

It was my thought that this method of application might also be of interest to other cement chemists, and the fact that a similar application has been published in Germany detracts little if any from the value of my article in America as many cement chemists in America do not read German.

ARTHUR J. POOL.

## Chain Belt Completes Stearns Conveyor Transfer

The Chain Belt Co., Milwaukee, Wis., recently completed the transfer to Milwaukee of all of the manufacturing operations of its subsidiary, the Stearns Conveyor Co., of Cleveland, O., which it acquired in 1926. The last operation to be moved to the Milwaukee plant is the manufacture of Rex-Stearns belt conveyor idlers. L. B. McKnight, formerly secretary and sales manager of the Stearns Conveyor Co., has, since the consolidation of the sales and engineering of the two companies in 1932, been manager of conveyor sales for the parent company. Geo. M. Dyke, vice president and operating manager of the Stearns Conveyor Co., formerly a member of the Chain Belt organization, will again be associated with the parent company in an executive capacity.

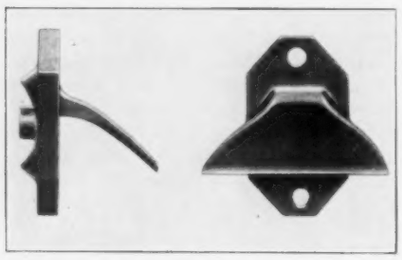
### Correction

In the January, 1934 issue of PIT & QUARRY the statement was made that a manufacturer claimed a drill of their manufacture to be "the first and only all-steel full-crawler-mounted percussion drill ever made for drilling holes of 6-in. and smaller diameter." The Bucyrus-Erie Co. states that it makes and has made for several years "an all-steel drill, full-crawler-mounted for drilling holes of 6-in. or smaller." This drill is the Bucyrus-Armstrong No. 26 blast-hole drill.

# New Machinery and Supplies

## Adjustable Nozzle Delivers a Fan-Shaped Water Spray

The Deister Concentrator Co., Fort Wayne, Ind., has developed the Concenco spray nozzle designed for washing sand and gravel and other materials. The J-132 series of nozzles is furnished with orifices



Nozzles which deliver fan-shaped spray.

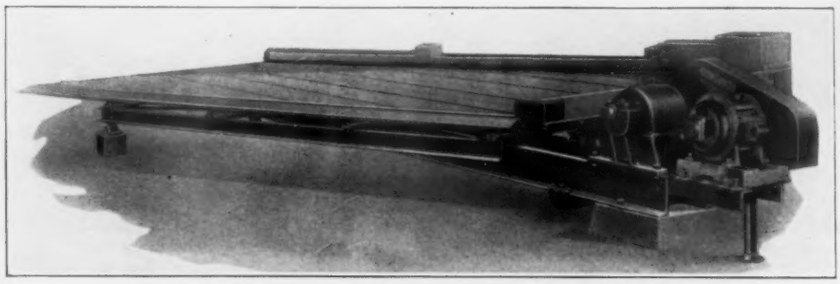
ranging from ⅛-in. to ⅜-in. and delivers a fan-shaped sheet of water. This series is designed to fit a 1-in., 1¼-in., or 1½-in. line. Putting a series of these nozzles on one line creates an unbroken sheet of water which is said to assure effective washing. The chief feature claimed for this nozzle is its ease of assembly. An oversize hole is drilled in the spray line and the nozzle attached and tightened up against a rubber gasket which forms the seal between the nozzle and the line. Any slight error which might be made in aligning the holes can be compensated for by adjusting the nozzle.

## New Screen Plate Combines Square and Round Openings

The Hendrick Mfg. Co., Carbondale, Pa., has developed the "Sqround Mesh" perforated plate for screens. This new mesh is said to combine the good features of both round and square openings. It is said that it eliminates the oversize which goes through the diagonal dimension of a square mesh because the distance between the fillets in the corners of "Sqround Mesh" is the same as the diameter of an equivalent round mesh. This new mesh is furnished in either flat plates or in double corrugated plate.

## Diagonal-Deck Washing Table Removes Gravel Impurities

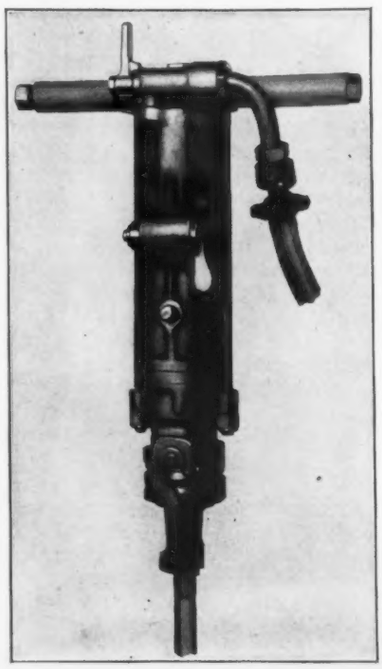
The Deister Concentrator Co., Fort Wayne, Ind., manufactures the Deister-Overstrom diagonal-deck sand and gravel washing table which is designed to remove impurities lighter or heavier than the gravel or sand. This table operates on the wet gravity principle and has a driving mechanism which imparts a differential motion to the deck which spreads it out and advances the heavier material along the table. This mechanism is totally enclosed and reciprocates the deck at the rate of from 265 to 320 strokes per minute. The deck is covered with either linoleum or rubber and has a riffling of hardwood or rubber which aids in separating the material on the deck. Wash water is applied to the table so as to flow crosswise or at right angles to the direction of the table's reciprocation. Under the floative agency of the water and assisted by the riffles the different particles of material stratify and separate out continuously along the table deck. The heavier material discharges at the end of the table and the light material washes over the side. The capacities of the tables increase with the size of materials treated and are governed also by the degree of separation desired, the characteristics of the material, and the nature of the impurities. Gravel up to 2 in. in size can be treated. It is said that this table will also effectively remove iron pyrites and other impurities in the making of high-grade glass sand.



Diagonal-deck washing table which removes impurities from sand and gravel.

## Design Heavy Sinker Drill for Deep Quarry Drilling

The Chicago Pneumatic Tool Co., New York, N. Y., has developed a new heavy sinker drill which is made in two types, CP-52 for dry work and CP-52W for wet work. This drill is recommended for heavy sinking in hard ground, long hole quarry drilling, etc., and is equipped with an exhaust choke for emergency blowing for cleaning the hole of drill cuttings. The standard chuck is a 1-in. hex. by 4¼-in., but other sizes are also available.



New heavy sinker drill.

## Positive-Seal Pipe Coupling for Straight Plain-End Pipe

The Champion Machine & Forging Co., Cleveland, O., has developed a positive-seal pipe coupling which is said to make it possible to join straight plain-end pipe

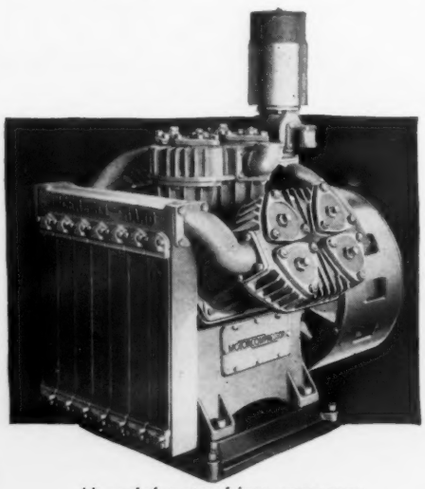
Positive-seal pipe coupling.

without grooving, threading, beveling or upsetting the ends. No extra finishing operation is necessary. Tension tests, it is said, show an efficiency in tension in excess of the strength of a thread and coupled joint. The gasket is so designed as to provide a double seal which is equally effective against either pressure or vacuum. Two special steel reinforcements 180 deg. apart on the gasket protect it from the pinching action of the two halves of the coupling when being assembled on the pipe.

The coupling consists of five parts: two half-coupling sections which contain gripping devices, one gasket with metal protected sections, and two bolts. Coupling sections are drop-forged special-grade steel and gripping-rings are drop-forged and heat-treated and assembled into half-coupling sections in such a manner as to become integral with the coupling itself.

## New Type of Motor-Driven Air-Cooled Air-Compressor

A new type of air compressor which requires no cooling water and which is accordingly particularly adapted to certain



Air-cooled motor driven compressor.

applications where water is scarce, costly, or objectionable, has been developed by Ingersoll-Rand Co., New York City. The new machine is called the Motorcompressor and has a built-in motor. The mo-

tor rotor is carried on the compressor shaft and the motor frame is bolted directly to the compressor crankcase. This construction eliminates a coupling, as well as motor bearings. A rigid sub-base underneath the entire unit makes a compact machine.

The Motorcompressor is a 2-cyl., 2-stage machine. Cylinders and intercooler are air cooled. Units are built in sizes from 20 to 50 hp., with piston displacements from 113 to 310 cu. ft. per min. and for discharge pressures up to 125 lbs. gauge. The overall efficiency is said to be equal to or better than in conventional water-cooled compressors of corresponding capacities. The Motorcompressor can be used for general service or as a standby unit wherever air is required, but is especially suited for locations where water cooling is objectionable or out of the question because of the freezing hazard or for other reasons.

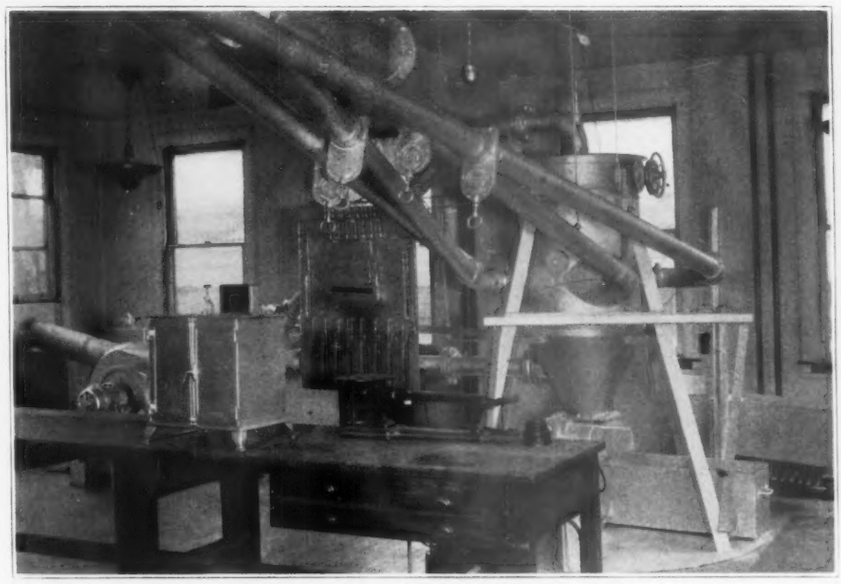
## Convertible Utility Crane Has High Transporting Speed

The Harnischfeger Corp., Milwaukee, Wis., announces a new-type general utility crane known as the "Hustler," which is said to combine high transporting speed

New type general-utility crane.

with unusual capacity and stability. It is also convertible to clamshell crane, dragline, pile driver or tractor service. One of the features is the flexible drum arrangement, the two side drums and the front drum each rotating independently. Each drum has three forward speeds and one reverse. The 3-speed traction gives speeds ranging from 1.3 to 5.2 miles per hr.

Friction clutches are of the band type with large diameter to insure smooth operation with heavy loads. Loads may also be lowered by power by throwing in the reverse gear. All gears are fully-enclosed and run immersed in oil. Roller bearings are used in the main machinery and renewable bronze bearings in the traction mechanism. With a detachable stiff-leg under the boom the machine is said to be able to lift 35,000 lb.



Part of dust-collecting laboratory maintained by Blow-Knox Co. for analyzing dedusting problems.

## Shovel Manufacturer Adds New Line of Truck Shovels

The Michigan Power Shovel Co., Benton Harbor, Mich., manufactures a truck shovel which is designed to meet the demand for a unit of small size which can be readily and quickly moved from place to place. This shovel moves under its own power at speeds up to 20 mi. per hr. and is always ready for work. In addition to portability features of this shovel are full-circle loading, no tail swing, and short wheel base. This unit can be converted into a truck crane in about two hours' time by merely substituting a 25-ft. crane boom for the regular shovel boom and dipper sticks. The crane unit may also be equipped with a drag-line bucket.

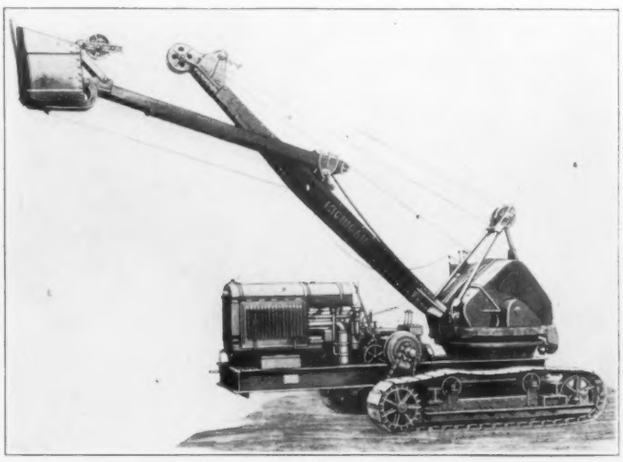
The power plant is a 50-hp. Continental 4-cyl. gasoline engine but a 60-hp. heavy-duty, 6-cyl. Hercules engine can be supplied. Balloon tires are standard with dual tires on the rear wheels, and hydraulic brakes are used on all four wheels. The transmission is of the heavy-duty automotive type with four speeds forward and one reverse. Timken wheel bearings are used and electric starting and lighting equipment is standard. The shovel has a gross weight, with a 4,000-lb. counterweight, of 20,000 lb., and has a wheel base of 139-in. and an overall width of 7-ft. 11-in.

The turn-table mechanism is full-revolving but the power plant remains stationary. The frame is of heavy ship channels braced with cross beams, all riveted and electric welded. Crowd and hoist brakes are enclosed and of the internal expanding type and double disc clutches are used. The crowding mechanism has a positive chain drive with equalizer adjustment mounted on shipper shaft bracket. The circle gear and center post are cast integrally of electric steel. In addition to the hoist and auxiliary drums a drum and clutch assembly for crane, clamshell and dragline work is part of the standard equipment.

The Michigan ⅜-cu.yd. crawler shovel, like the truck shovel, has a full-revolving digging unit with a stationary power plant. Many other features are also the same. The crawler shovel is mounted on self-cleaning crawlers with extra-wide shoes measuring 15-in. across. These crawlers are equipped with Zerk fittings for greasing. Like the truck shovel it also can be converted to crane or dragline.

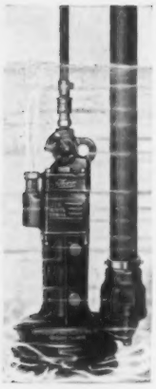
## Portable Air-Driven Pump Operates When Submerged

A new, portable, air-operated pump that is said to have a larger capacity at a



Michigan full-revolving convertible crawler shovel.

New Michigan convertible truck shovel.



Portable air-operated pump.

Bulldozer on Cletrac tractor.

higher head, has just been put on the market by the Independent Pneumatic Tool Co., Chicago, Ill. No priming is required to start the pump, as it is designed to run partly or fully submerged. Construction is one-piece, forming a self-aligned, compact and sturdy unit.

The impeller, being of the closed type, minimizes wear due to sand and abrasive dirt in water, and also increases the capacity of the pump. A variable-speed throttle controls the speed and capacity, and a governor prevents the motor from over-speeding, so that no damage will result when the pump is running free. The pump is 22 in. in length and weighs 48 lbs. It is claimed that 230 gal. will be discharged in one minute at 90 lbs. pressure at 10 ft. of water, while at 70 ft. 100 gal. will be discharged.

## Special Safety Shoe for Use in Quarries and Mines

The Peters Branch of the International Shoe Co., St. Louis, Mo., has developed a new Hy-Test safety shoe especially designed for men working in quarries, mines and plants. This shoe, listed as No. H-790, is built over a comfortable, roomy high toe that is said to prevent chafing. The extra gauge steel box toe is said to give

Special quarry safety shoe.

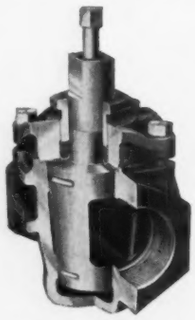
unusual protection and the new flange construction of the box to insure positive anchorage and to prevent pinching of the foot. A high grade of Retan leather is used with a heavy composition outsole and a high-quality leather middle sole. It is of brass-nailed and sewed construction and has a built-in steel arch support.

## Bulldozer Which Does Not Hinder Other Tractor Uses

The Austin-Western Road Machinery Co., Chicago, Ill., recently announced the new Western No. 35 bulldozer for use with the Cletrac 35 tractor. This unit is said to weigh only 1,800 lb. and to be of simplified construction. It is said to be easy to attach or remove and that the blade and push beams can be removed in a few minutes. The blade can be raised or lowered to any position and held rigidly or it can be allowed to float; the tilt of the blade can also be varied. A gear pump provides positive manipulation, and pressure is applied to the blade in both directions. A lever-operating 4-way valve provides finger-tip control. The heavily-reinforced blade is said to roll the material instead of pushing a dead load ahead, and the high-carbon-steel bit is reversible to provide double wear. Shoes of wear-resisting alloy steel have replaceable soles. It is also said that the adaptability of the tractor is not impaired, turning clearances are not restricted, and the oil pump is mounted out of the way behind the driver's seat in position of power takeoff.

## Merco Nordstrom Makes Line of Duplicate Plug Valves

The Merco Nordstrom Valve Co., a subsidiary of the Pittsburgh Equitable Meter Co., Pittsburgh, Pa., markets a line of lubricated plug valves which are said to be especially suited for slurry lines in cement plants. Positive shutoff and elimination of sticking, it is claimed, are made possible by the patented "Sealdport" method of lubrication found in all Nordstrom valves. The arrangement of lubricant grooves on the plug and body prevents the lubricant from being blown from the valve by pressure in the line.



Lubricated plug valve.

Two-way valve.

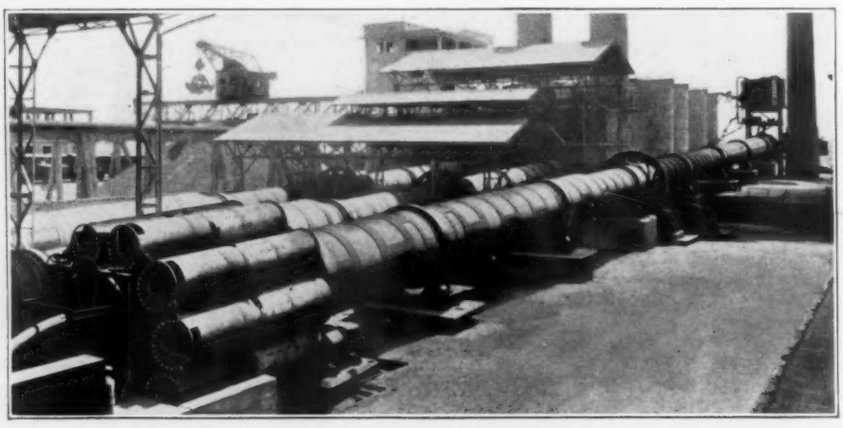
Three-way valve.

## Wide-Range Pressure Gauge and Recording Thermometer

The Brown Instrument Co., Philadelphia, Pa., has developed a new recording thermometer and pressure gauge of the distant indicating and recording type, pressure gauges for ranges from 10-in. of

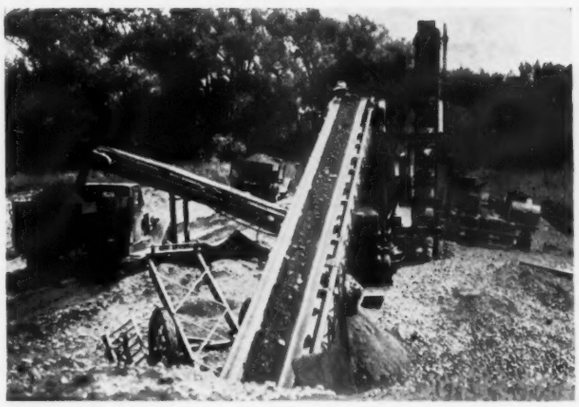
Combination thermometer and pressure gauge.

which is actuated by liquid, gas and vapor. The interchangeable helix on these instruments makes it possible to record pressure and temperature on one chart. These instruments are offered with 8-in. and 12-in. circular charts and in one, two or three pen models. They include thermometers in indicating and recording types for temperatures from —40 deg. F. to 1200 deg. F., and indicating or recording water up to 5,000 lb. An a.c. electric clock is standard, but where this current is not available a hand-wound clock is furnished.



A recent installation of a 500-ft. F. L. Smidth & Co. Unox kiln and cooler in a cement plant.

# "CRACK DOWN!" - on High Costs -



Typical Universal Unit Plant in action. This advanced equipment is winning widespread notice for its extra large capacity, faster and better grading, and lower cost per ton of output.

THE government says industry MUST operate at a profit. That is not easy with today's conditions and yeserday's equipment. New times call for new methods and new machines.

Remember that construction work is now definitely on the "up" and is fast gaining momentum from the "big push" initiated by PWA and CWA. You can profit most from this boom by acting now and taking advantage of the record low costs that go with the use of UNIVERSAL CRUSHERS.

They are preferred by successful operators on important projects everywhere. An index of their popularity is the steadily increasing volume of purchases—crushers and unit plants in all sizes, stationary and portable. Yes, Universal orders are piling up—not a sign of delay, but a tribute to demand.

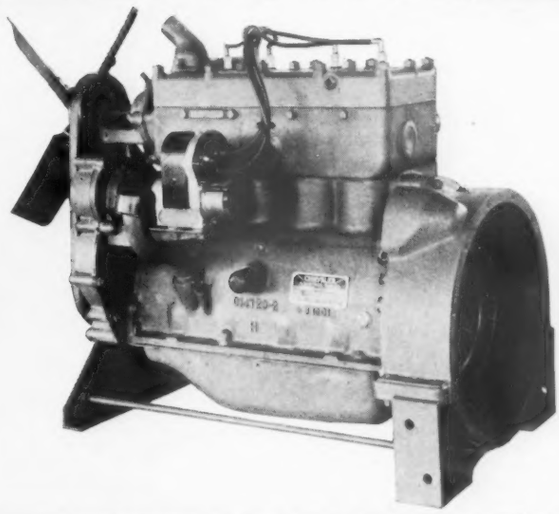
Send for Catalog, and select your UNIVERSAL CRUSHER for early delivery on your next stone and gravel crushing job.

## UNIVERSAL CRUSHER COMPANY

619-C Avenue West, Cedar Rapids, Iowa



# IT'S A CHRYSLER ENGINE



## . . . THERE'S NO QUESTION OF ITS PERFORMANCE AND QUALITY

Chrysler Industrial Engines are engines of proved ability and performance. They are designed by leading engineers. Built to finer limits of precision. Cost less to buy and to maintain. Possess enviable records for ruggedness and long life.

Investigate Chrysler power. Compare it and see how it out-performs and outlasts. We will be glad to furnish you with power charts and complete specifications.

Chrysler engines have an enviable record for ruggedness and long life. They can help you with your power problems. Charts and detailed specifications are available upon request.

Type Z-1—6-cylinder, 3⅜" bore x 5" stroke, 42 B. H. P. at 1200 R. P. M. 64 B. H. P. at 2000 R. P. M.

Type CM—6-cylinder, 3¼" bore x 4⅜" stroke, 32 B. H. P. at 1200 R. P. M. 48 B. H. P. at 2000 R. P. M.

Type PC—6-cylinder, 3⅛" bore x 4¼" stroke, 28 B. H. P. at 1200 R. P. M. 44 B. H. P. at 2000 R. P. M.

Type PA—(illustrated) 4-cylinder, 3⅜" bore x 4¾" stroke, 28 B. H. P. at 1200 R. P. M. 45 B. H. P. at 2000 R. P. M.

## CHRYSLER MOTORS

AMPLEX DIVISION • DETROIT, MICHIGAN

# Classified Buyers' Guide

## A Directory of Pit and Quarry Advertisers Arranged According to Product

*Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.*

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**Abrasives**
*Pangborn Corp.

**Aggregate Bituminizing Plants**
Pre-Cote Chemicals, Inc.

**Agitating Ladders (Dredge)**
*Eagle Iron Works

**Air-Conditioning Equipment**
*Pangborn Corp.

**Air Compressors (Portable)**
Amplex Mfg. Co.

**Air Separators**
Gay, Rubert M.
*Gruendler Crusher & Pulv. Co.
*Pangborn Corp.
Raymond Bros. Impact Pulv. Co.
Universal Road Mchy. Co.

**Alloys, Steel**
Chicago Steel Foundry Co.

**Ash and Refuse-Handling Equipment**
Allen-Sherman-Hoff Co.
*Bartlett & Snow Co., C. O.
*Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Automatic Feeders**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Automatic Weighers**
*Bartlett & Snow Co., C. O.

**Backfillers**
Austin-Western Road Machy. Co.

**Balls (Grinding)**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

**Balls (Tube-Mill, etc.)**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Jeffery Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

**Bearings (Anti-Friction)**
*Bartlett & Snow Co., C. O.
*Hetherington & Berner, Inc.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Belting**
Goodyear Tire & Rubber Co.
*Link-Belt Co.
Self-Vulcanizing Rubber Co.
Stephens-Adamson Mfg. Co.
Thermoid Rubber Co.

**Belting (Multiple V)**
Goodyear Tire & Rubber Co.
Thermoid Rubber Co.

**Bin Gates**
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Bins (Cast Iron)**
Allen-Sherman-Hoff Co.

**Bins (Steel)**
Austin-Western Road Machy. Co.
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
*Hetherington & Berner, Inc.
Iowa Mfg. Co.
Jeffery Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
Pioneer Gravel Equipment Mfg. Co.
Stephens-Adamson Mfg. Co.

**Bituminizing Plants**
Pre-Cote Chemicals, Inc.

**Blast-Hole Drills** (See Drills—Blast-Hole)

**Blasting Machines**
Atlas Powder Co.

**Blasting Supplies**
Atlas Powder Co.
*Ensign-Bickford Co.

**Blocks (Sheave)**
*Sauerman Bros., Inc.

**Blowers**
*Pangborn Corp.

**Bodies (Motor Truck, Concrete Mixing)**
*Bartlett & Snow Co., C. O.

**Borings, Core**
Mott Core Drilling Co.
Pennsylvania Drilling Co.
Sprague and Henwood, Inc.

**Brake Linings**
Thermoid Rubber Co.

**Bucket Elevators** (See Conveyors and Elevators)

**Buckets (Clamshell, Orange-Peel, Etc.)**
*Bartlett & Snow Co., C. O.
*Link-Belt Co.

**Buckets (Dragline—Cableway)**
*Bartlett & Snow Co., C. O.
*Link-Belt Co.
Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.

**Buckets (Elevator and Conveyor)**
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Cableways**
*American Steel & Wire Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

**Caps (Blasting)**
Atlas Powder Co.

**Capstans** (See Winches and Capstans)

**Car Dumpers**
*Link-Belt Co.

**Car Pullers**
*Bartlett & Snow Co., C. O.
Jeffery Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Cars (Quarry and Gravel Pit)**
Austin-Western Road Machy. Co.
Stephens-Adamson Mfg. Co.

**Cars (Dump)**
Stephens-Adamson Mfg. Co.

**Cars (Industrial)**
Stephens-Adamson Mfg. Co.

**Cars (Transfer)**
Stephens-Adamson Mfg. Co.

**Carriers**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Car Wheels** — (See Wheels — Car)

**Castings**
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
*Hetherington & Berner, Inc.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
Stephens-Adamson Mfg. Co.

**Cement Pumps** (See Pumps; Air Pumps; Pumps, Cement Slurry; Pumps, Bulk Cement)

**Central Concrete-Mixing Plants (Complete)**
*Bartlett & Snow Co., C. O.
Stephens-Adamson Mfg. Co.

**Chain Drives**
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Chain (Elevating and Conveying)**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Chutes and Chute Liners**
*Bartlett & Snow Co., C. O.
Goodyear Tire & Rubber Co.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Stephens-Adamson Mfg. Co.

**Classifiers**
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
*Pangborn Corp.
Stephens-Adamson Mfg. Co.

**Clips (Wire Rope)**
*American Steel & Wire Co.

**Clutches**
Jeffrey Mfg. Co.
*Link-Belt Co.

**Coal-Pulverizing Equipment**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Gay, Rubert M.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Raymond Bros. Impact Pulv. Co.
Universal Road Mchy. Co.

**Compressors** (See Air Compressors)

**Concentrators (Slurry)**
*Deister Concentrator Co.

**Cones (Sand-Washing)**
*Bartlett & Snow Co., C. O.
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*Link-Belt Co.
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**Conveyors Idlers and Rolls**
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*Bartlett & Snow Co., C. O.
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Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Conveyors and Elevators**
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Barber-Greene Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulv. Co.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.
Universal Crusher Co.
Universal Road Machy. Co.

**Conveyors (Ready-Mixed Concrete)**
*Bartlett & Snow. Co., C. O.
Jeffrey Mfg. Co.

**Coolers** (See Kilns and Coolers —Rotary)

**Couplings (Flexible and Shaft)**
Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Couplings (Hose, Pipe, etc.)**
Thermoid Rubber Co.

**Cranes (Crawler and Locomotive)**
Austin-Western Road Mchy. Co.
*Link-Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Ohio Power Shovel Co.

**Crusher Parts**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.

**Crushers (Cone)**
*Nordberg Mfg. Co.

**Crushers (Hammer)**
*Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
*Bartlett & Snow Co., C. O.
*Dixie Machy. Mfg. Co.
*Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Universal Crusher Co.

**Crushers (Jaw and Gyratory)**
*Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulv. Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Nordberg Mfg. Co.
Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Universal Crusher Co.
Universal Road Mchy. Co.

**Crushers (Ring)**
*Bartlett & Snow Co., C. O.

**Crushers (Roll)**
*Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equipment Mfg. Co.

**Crushers (Rotary)**
*Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
*Bartlett & Snow Co., C. O.

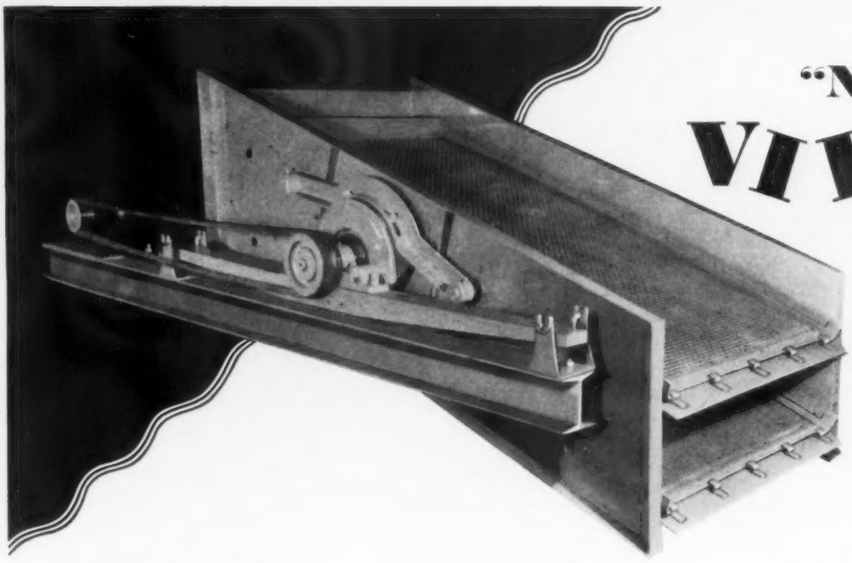
**Crushing Rolls**
*Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.

**Detonators**
Atlas Powder Co.

**Diesel Engines** (See Engines—Diesel)

**Dragline Cableway Excavators**
*Link-Belt Co.
*Sauerman Bros., Inc.

*** See also information in the 1933 Pit and Quarry HANDBOOK.**



## The New "Normal-Duty" VIBRATOR SCREEN

This new "normal-duty" screen is another successful S-A Vibrator Screen, **of the same high-grade, S-A design and construction, but unusually low in cost.**

It has been especially built for screening materials up to 2 inches in size—where a high-grade screen is wanted but the loads and shocks do not necessitate the massive construction of the well-known S-A "heavy-duty" Vibrator Screen.

Write for folders describing the "normal-duty" and the "heavy-duty" Vibrator Screens. You will find such features as the new and better method of stretching screen panels, the new cradle-spring mounting for absorbing vibration and the new stabilizer, which makes it easier to adjust the screening angle and to change screen panels.

Complete Stone and Gravel Plants

Write for Catalog 34, describing complete Stephens-Adamson stone and gravel plants and showing the entire line of S-A conveying, screening, washing and batching equipment.

**Stephens-Adamson Mfg. Co.**

**Los Angeles, Cal. Aurora, Ill. Belleville, Ont.**

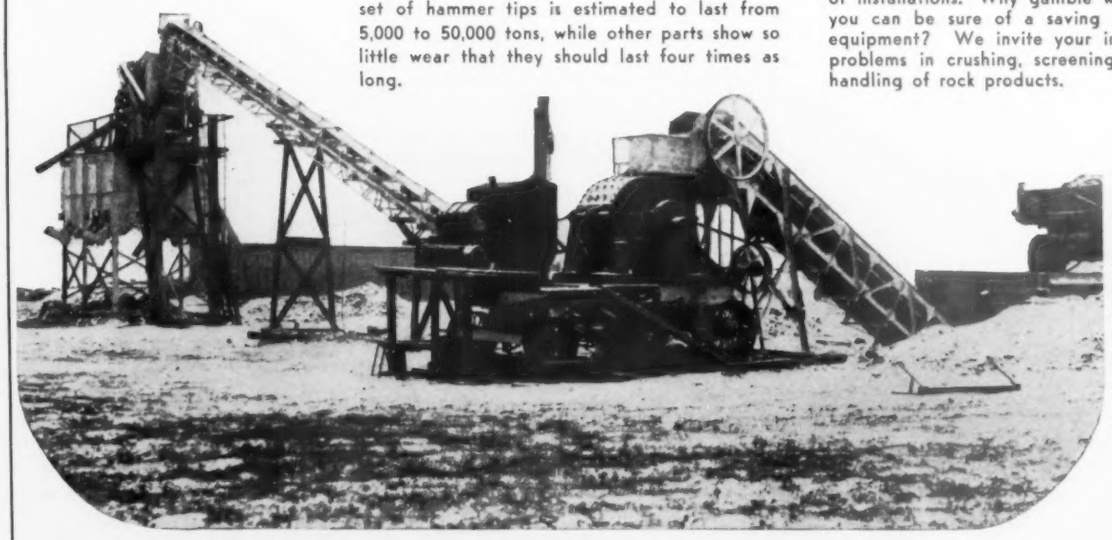
***Conveyors—Screens—Washers—Complete Plants***

## "We can produce at less cost per ton"

writes the operator of the Weaver Stone Quarry at Watsontown, Pa. He is using a Gruendler portable rock crushing plant with a 5xB Hammermill which is doing the work of both the former primary and secondary crushers at lower power cost, less maintenance and smaller initial cost.

With one reduction, a more cubical product is made, with no flats, at a higher tonnage rate. On blocky limestone, some particularly hard, a set of hammer tips is estimated to last from 5,000 to 50,000 tons, while other parts show so little wear that they should last four times as long.

That is typical performance of Gruendler rock and gravel crushing and screening plants. They are setting new standards of economy in scores of installations. Why gamble with costs, when you can be sure of a saving with Gruendler equipment? We invite your inquiries on any problems in crushing, screening, conveying or handling of rock products.



Gruendler plant at Weaver Stone Quarry, crushing 1200 tons per day 3", and 400 tons of ¾" aggregate material. One reduction.

**GRUENDLER CRUSHER & PULVERIZER CO.**

**Dept. P&Q, 2915 N. Market Street St. Louis, Missouri**

# Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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Northwest Engr. Co.
Ohio Power Shovel Co.
*Sauerman Bros., Inc.

**Dredges**
*Hetherington & Berner, Inc.
*Morris Machine Works

**Drilling Contractors**
Mott Core Drilling Co.
Pennsylvania Drilling Co.
Sprague and Henwood Inc.

**Drills, Diamond**
Mott Core Drilling Co.
Pennsylvania Drilling Co.
Sprague and Henwood Inc.

**Drills (Rock)**
Jeffrey Mfg. Co.

**Drills (Well)** (See Drills—Blast-Hole)

**Drives (Multiple, Belt, Chain, Rope)**
*Allis-Chalmers Mfg. Co.

**Dryers**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.

**Dust Arresters**
*Pangborn Corp.

**Dust-Collecting Systems**
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Pangborn Corp.
Raymond Bros. Impact Pulv. Co.

**Dust Handling Systems (Hydro Vacuum)**
Allen-Sherman-Hoff Co.

**Dynamite** (See Explosives)

**Electrical Equipment**
*Allis-Chalmers Mfg. Co.

**Elevator Belting** (See Belting)

**Elevators** (See Conveyors and Elevators)

**Engineers**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Pangborn Corp.
Stephens-Adamson Mfg. Co.

**Engines (Diesel)**
*Nordberg Mfg. Co.

**Engines (Internal-Combustion)**
Amplex Mfg. Co.
*Nordberg Mfg. Co.

**Engines (Steam)**
*Morris Machine Works
*Nordberg Mfg. Co.

**Excavating Machinery** (See Shovels; Cranes; Buckets; etc.)

**Explosives**
Atlas Powder Co.

**Fans (Exhaust)**
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

**Feeders**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
Morrow Mfg. Co.
Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Floor Sweeping Systems (Hydro Vacuum)**
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**Fuses (Detonating)**
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*Ensign-Bickford Co.

**Gaskets**
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Thermoid Rubber Co.

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**Gas Producers**
Wellman Engr. Co.

**Gates (Bin)** (See Bin Gates)

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Jeffrey Mfg. Co.
*Link-Belt Co.

**Gears and Pinions**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.

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Lewistown Foundry & Machine Co.

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*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.

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*Eagle Iron Works
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.
Universal Road Mchy. Co.

**Guards (Wire)**
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**Guns (Hydraulic)**
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*Hetherington & Berner, Inc.

**Hammer Mills** (See Crushers—Hammer)

**Hoists**
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*Hetherington & Berner, Inc.
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Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.
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*Hendrick Mfg. Co.

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Goodyear Tire & Rubber Co.
Self-Vulcanizing Rubber Co.
Thermoid Rubber Co.

**Hose Couplings** (See Couplings)

**Hydraulic Guns** (See Guns—Hydraulic)

**Idlers**
Barber-Greene Co.
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Kilns and Coolers (Rotary)**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Kennedy-Van Saun Mfg. and Eng. Corp.

**Lime-Handling Equipment**
*Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Link-Belt Co.
Raymond Bros. Impact Pulv. Co.
Stephens-Adamson Mfg. Co.

**Lime Kilns**
*Bartlett & Snow Co., C. O.
*Kennedy-Van Saun Mfg. and Eng. Corp.

**Linings (Ball- and Tube-Mill)** (See Mill Liners and Linings)

**Liquid Rubber**
Self-Vulcanizing Rubber Co.

**Loaders and Unloaders**
Barber-Greene Co.
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Locomotives (Electric, Gas and Steam)**
*Lima Locomotive Works

**Locomotives (Trolley-Battery)**
Jeffrey Mfg. Co.

**Magnetic Pulleys** (See Pulleys, Magnetic)

**Mill Liners and Linings**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

**Mills (Grinding)** (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mch. Co.
Raymond Bros. Impact Pulv. Co.

**Motor Trucks**
General Motors Truck Co.

**Motors and Generators**
*Allis-Chalmers Mfg. Co.

**Motors (Internal-Combustion)** (See Engines — Internal-Combustion)

**Nails**
*American Steel & Wire Co.

**Nozzles (Hydraulic)** (See Guns—Hydraulic)

**Packings**
Goodyear Tire and Rubber Co.
Self-Vulcanizing Rubber Co.

**Pawls**
Stephens-Adamson Mfg. Co.

**Perforated Metal Plates**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
Morrow Mfg. Co.

**Pipe Flanges**
Georgia Iron Works
*Hetherington & Berner, Inc.

**Plastic Rubber**
Self-Vulcanizing Rubber Co.

**Plug Valves** (See Valves)

**Pneumatic Drills** (See Drills, Rock)

**Portable Conveyors**
Barber-Greene Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
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**Portable Crushing and Screening Plants**
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*Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulv. Co.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
Pioneer Gravel Equipment Mfg. Co.
Stephens-Adamson Mfg. Co.
Universal Crusher Co.

**Portable Engines** (See Engines—Internal Combustion)

**Portable Loaders** (See Loaders and Unloaders)

**Power Cables (Rubber Clad)**
*American Steel & Wire Co.

**Power Shovels** (See Shovels, Electric, Internal-Combustion and Steam)

**Pulverized Fuel Systems**
*Bartlett & Snow Co., C. O.
Gay, Rubert M.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Raymond Bros. Impact Pulv. Co.
Universal Road Mchy. Co.

**Pulverizers** (See also Crushers; Mills; etc.)
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*Bartlett & Snow Co., C. O.
Gay, Rubert M.
Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
Raymond Bros. Impact Pulv. Co.
Universal Crusher Co.

**Pump Valves** (See Valves Pump)

**Pumps (Cement Slurry)**
Allen-Sherman-Hoff Co.
*Morris Machine Works

**Pumps (Centrifugal)**
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Georgia Iron Works
*Hetherington & Berner, Inc.
Kansas City Hay Press Co.
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*Allis-Chalmers Mfg. Co.
Georgia Iron Works
*Hetherington & Berner, Inc.
*Morris Machine Works

**Pumps (Sand and Gravel)**
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Georgia Iron Works
*Hetherington & Berner, Inc.
*Morris Machine Works
Kansas City Hay Press Co.

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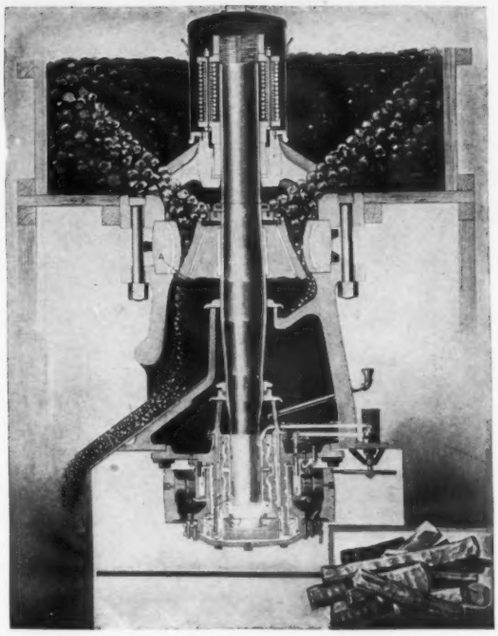

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# Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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**Ready-Mixed Concrete Plants**
*Bartlett & Snow Co., C. O.
Stephens-Adamson Mfg. Co.

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*Kennedy-Van Saun Mfg. and Eng. Corp.

**Rope (Wire)** (See Wire Rope)

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Self-Vulcanizing Rubber Co.

**Safety Appliances**
*Pangborn Corp.

**Sand-Blast Equipment**
*Pangborn Corp.

**Sand Separators**
*Bartlett & Snow Co., C. O.
Jeffrey Mfg. Co.
*Link-Belt Co.
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**Sand-Settling Tanks**
*Bartlett & Snow Co., C. O.
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*Link-Belt Co.
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Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Scrapers (Power Drag)**
Austin-Western Road Mchy. Co.
Iowa Mfg. Co.
*Link-Belt Co.
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*Sauerman Bros., Inc.

**Screens**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Deister Concentrator Co.
Deister Machine Co.
*Eagle Iron Works
Gay, Rubert M.
*Gruendler Crusher & Pulv. Co.
*Hendrick Mfg. Co.
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Universal Crusher Co.
Universal Road Mchy. Co.

**Screens (Vibrating or Shaking)**
*Allis-Chalmers Mfg. Co.
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Barber-Greene Co.
*Bartlett & Snow Co., C. O.
*Deister Concentrator Co.
Deister Machine Co.
Gay, Rubert M.
*Gruendler Crusher & Pulv. Co.
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Smith Engr. Works
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*Eagle Iron Works
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*Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.

**Shovels (Electric, Internal Combustion and Steam)**
Austin-Western Road Mchy. Co.
*Link-Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Ohio Power Shovel Co.

**Skip Hoists and Skips**
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*Bartlett & Snow Co., C. O.
*Hetherington & Berner, Inc.
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*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Speed Reduction Units**
Iowa Mfg. Co.
*Link-Belt Co.
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**Sprockets and Chain**
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*Link-Belt Co.
Stephens-Adamson Mfg. Co.

**Stackers**
Jeffrey Mfg. Co.

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**Steel Plate Construction**
*Hendrick Mfg. Co.
*Hetherington & Berner, Inc.

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Jeffrey Mfg. Co.
*Link-Belt Co.
*Sauerman Bros., Inc.
Stephens-Adamson Mfg. Co.

**Sweeping Systems**
Allen-Sherman-Hoff Co.

**Tanks**
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.

**Tanks (Sand-Settling)**
*Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
Jeffrey Mfg. Co.
*Link-Belt Co.
Morrow Mfg. Co.
Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
Stephens-Adamson Mfg. Co.

**Tools (Drill)** (See Drilling Accessories)

**Track Shifters**
*Nordberg Mfg. Co.

**Tractors**
*Allis-Chalmers Mfg. Co.

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**Tramways (Aerial)**
*American Steel & Wire Co.

**Transformers**
*Allis-Chalmers Mfg. Co.

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**Transmission Machinery**
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*Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
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**Trippers**
*Bartlett & Snow Co., C. O.
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*Link-Belt Co.
Stephens-Adamson Mfg. Co.

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*Bartlett & Snow Co., C. O.

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**Underground Loaders**
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.

**Unloaders (Box Car)**
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**Vibrating Screens** (See Screens—Vibrating)

**Washers (Sand, Gravel and Stone)**
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Manganese Steel Forge Co.

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**Wheels (Car)**
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**Wire Rope Slings**
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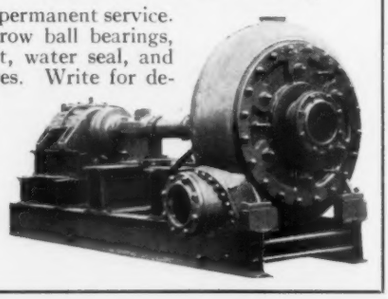

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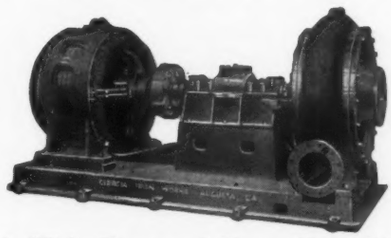

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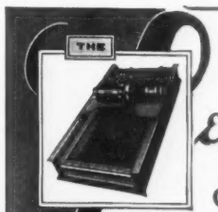

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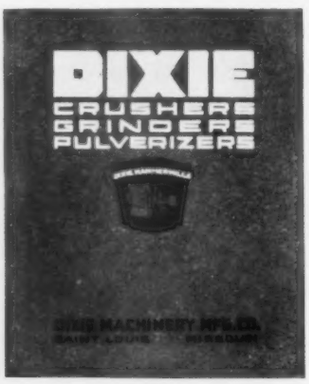


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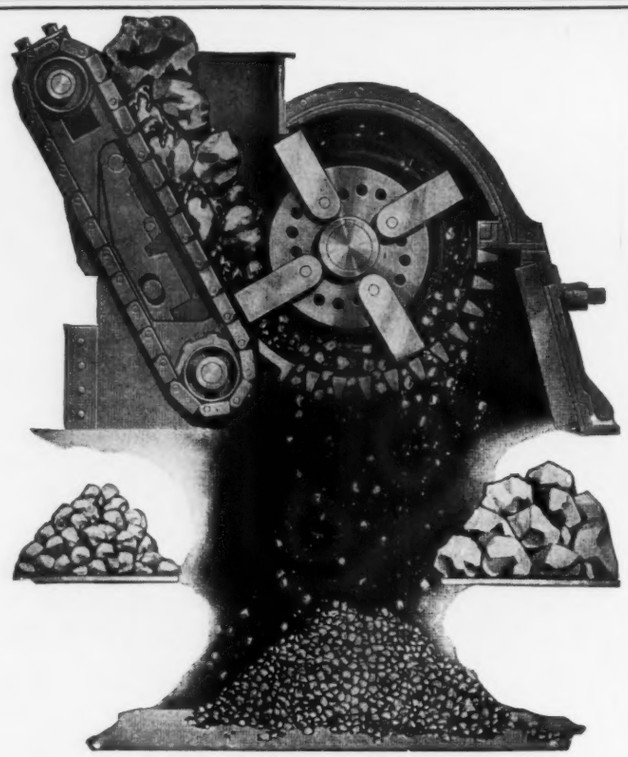

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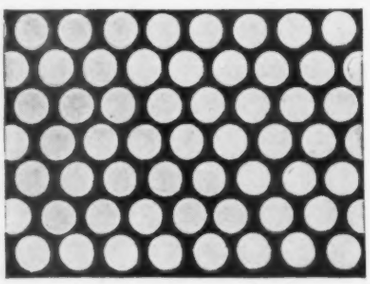

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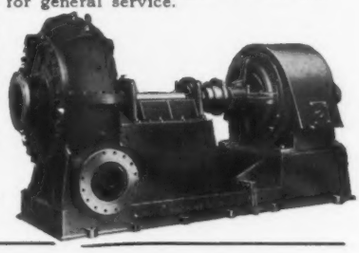

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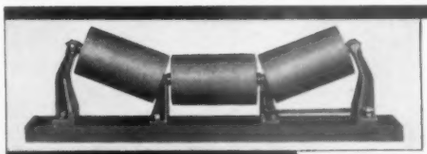

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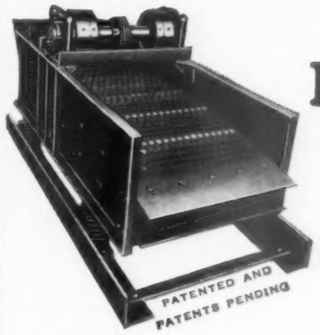


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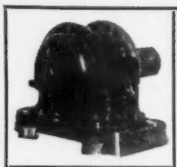

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Also have large number of used crushers, pulverizers, pumps, shovels, draglines, and other equipment for the Power Plant.

ROSS POWER EQUIPMENT CO.
Indianapolis, Indiana

## DIAMOND CORE DRILLING

CONTRACTORS
FIRECLAY, ASPHALT, LIMESTONE, COAL AND ALL MINERALS
Light Gasoline Outfits

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HUNTINGTON, W. VA.

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2—3½ ton WHITCOMB Locomotives 24" gauge .....Each, $350.00
25—1-yd. and 1½-yd. 24" gauge cars.
One mile of 24" gauge industrial track.

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## CORE BORINGS DIAMOND DRILLING

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## LOCOMOTIVE CRANE

Brownhoist locomotive crane 45 ft. boom; 10 ton capacity; cheap for immediate sale.

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## WE LOOK INTO THE EARTH

By using Diamond Core Drills We drill for Limestone, Gypsum, Talc. Fire Clay. Coal and all other minerals.

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Drilling Contractors
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Established gravel business with orders on hand and in view, on profitable basis. Owner has other interests. Good business opportunity.

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Cairo, Ill.

## FOR SALE—BARGAINS

1½ yd. Blaw Knox dread. clam shell bucket
2½ yd. A.M.S.C. heavy duty dragline bucket
25 ton Brown D/D Loco. steam crane $2,000.

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## SWEDISH HOLLOW DRILL STEEL GUARANTEED 100% PERFECT

Considerably below market prices.
20 ton ⅞-in. Hexagon.
50 ton ⅞-in., 1-in., 1⅛-in., 1¼-in., and 1⅜-in. Round, Hexagon and Quarter Octagon.

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## For Sale or Rent

12, 16, and 20-yd. Side Dump Cars.
50-ton Std. Gauge Locomotives.
1-yd. Link-Belt Cranes and Draglines.
1-yd. Northwest Shovel-Draglines.
Also general construction equipment.

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## FOR SALE USED EQUIPMENT IN STOCK

1—Marion 37 Steam Shovel, 1¾-yd., on Caterpillars.
1—Northwest 1-yd. Gas Combination Crane and Shovel.
1—Universal Truck Crane.
1—60-Caterpillar Tractor with La Plante Hydraulic Bulldozer.
1—Universal ⅜-yd. Gas Combination Trench Hoe & Shovel.
1—Koehring ¾-yd. Gas Crane on Caterpillars.

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4882 Springle Ave. Detroit, Mich.

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One second hand Main Frame in good condition, for No. 8 Austin Gyratory crusher, or would purchase entire No. 8 crusher, if price is right.

NEWTON COUNTY STONE CO.
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## ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C. for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.
FORT WAYNE, IND.

## FOR SALE CHEAP

Slackline Outfit—Consisting of 1½-yard Sauerman bucket, 100-foot steel mast, 125 H.P. 2 speed hoist, etc. Write for particulars.

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Huntington, W. Va.

## WANTED

One 4 x 6 or 4 x 7 double-deck vibrating sand screen, motor driven. Must be in good condition and reasonable. Must be in a radius of 500 miles of Burlington, Iowa.

RIVERSIDE GRAVEL CO., Inc.
Omaha, Nebraska

## FOR SALE

Marion Gas-Electric ¾ yard Shovel.
Osgood 1-yard gas crawler shovel, overhauled.
Locomotives: 75-ton switcher code boiler; also saddle tank type, narrow and standard gauge.
CARS: side dump 12-yard; 50-ton steel twin hopper cars, etc.

SOUTHERN IRON & EQUIPMENT CO.
Atlanta, Ga.

## BARGAINS

3' Symons Cone Crusher
No. 12 Traylor Bull Dog Gyratory

California Equipment Co.
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FOR SEVERAL HUNDRED FEET 20" and 24" GOOD USED CONVEYOR BELTING.

WATAUGA STONE COMPANY
Knoxville, Tenn.

## Brand—New—Wire—Rope—For—Sale

At—Below—Market—Prices—Suitable—for—Hoisting—Guys—Draglines—Cableways—Dredges—Shovels—and—Etc.
All — Sizes — from—9/16" to 2¼"—Dia. Inclusive—Priced—Right—for—Immediate—Sale—Send — for Complete—List—

TERRENCE P. WYNN
100 West 72nd St. New York City
Phone—Trafalgar—7-0536

## FOR SALE

Page Walking Dragline Crane 75 h. p. Diesel Engine. 60 ft. Boom. 2 yd. Bucket. Good condition.

BEYRER BROS. SAND & GRAVEL CO.
312 S. St. Joseph St. South Bend, Ind.

## WANTED

12—2 yard 36" gauge standard low type Koppel Rocker quarry cars or similar end dump steel quarry cars.

L. G. Everist, Inc., Sioux City, Iowa

## FOR SALE

1 No. 2, 1 No. 3 Austin, 1 No. 4 Gates, 1 No. 5 Telsmith gyratory stone crushers, 1 11x22 Acme jaw crusher.

ROY VAIL
Clarksburg, Indiana

## FOR SALE

50 Ton Gas Loco. New 1929. Others 6 to 20 tons.
Monighan Diesel Walker Dragline, 3 yd., 75' boom.
Monighan & Page Diesel Walkers, 2 yd., 60' booms.
¾ Yd. Electric Cat. Shovel, Crane & Dragline.
Shovel Attachment for P&H 206. Others ½ to 4 yds.
Drag Scrapers, Slacklines, buckets, etc. ½ to 4 yds.
Compressors—Gas Portable, 50, 110, 160, 220 & 310'.
Crushers & Crushing Plants, 14x36—9x36—9x24, etc.
Diesel & Gas Engines, Buckets, Light Plants, etc.

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## WANTED

Experienced Limestone Mine Foreman. Must be capable of carrying on development work in new Mine. References covering experience and ability required. Address Box 300, Pit and Quarry Publications, 538 S. Clark St., Chicago.

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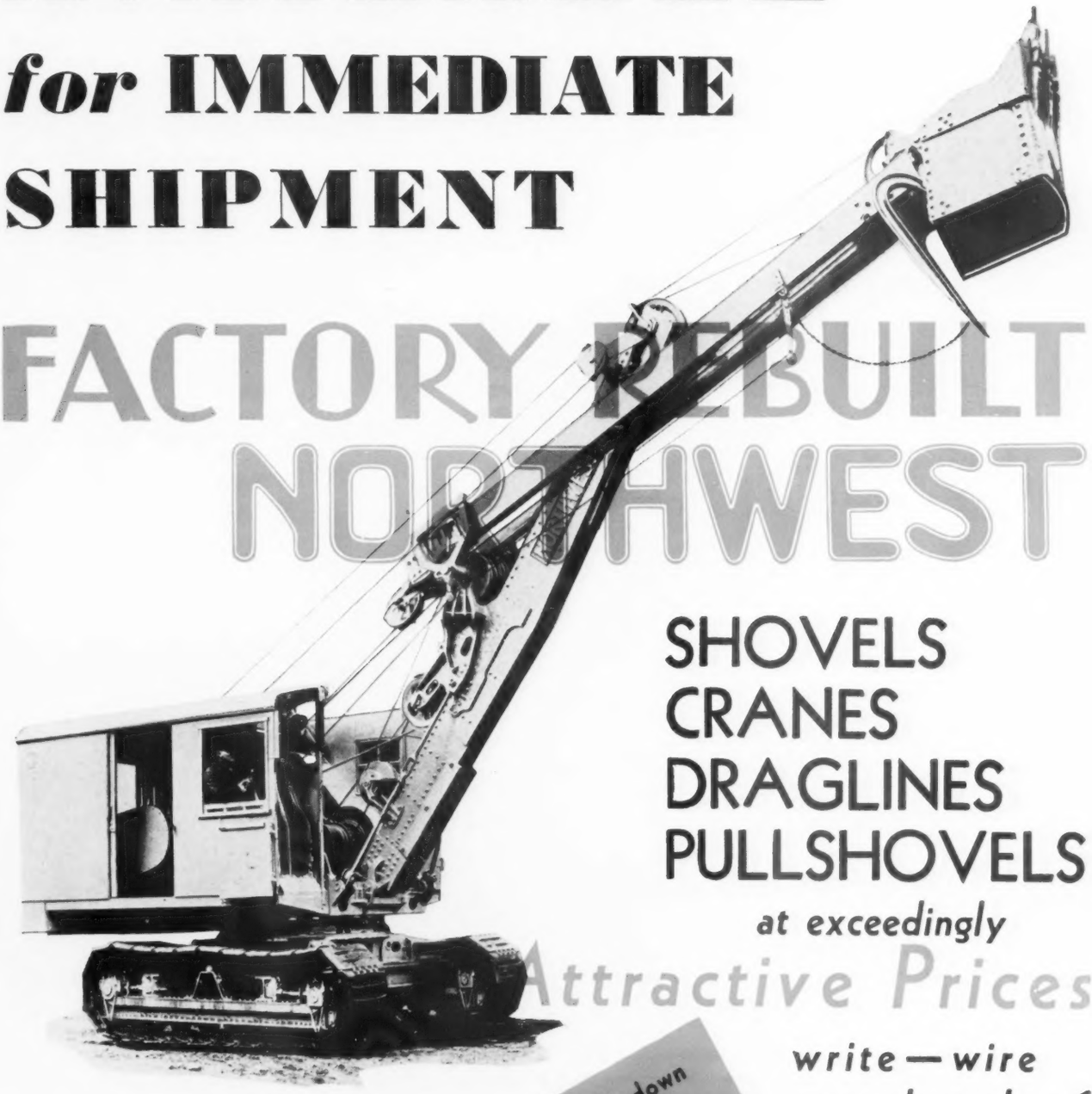
## *for* IMMEDIATE SHIPMENT



FACTORY REBUILT

NORTHWEST

SHOVELS
CRANES
DRAGLINES
PULLSHOVELS

*at exceedingly*
*Attractive Prices*

*write — wire or phone!*

These Machines have been completely torn down and rebuilt from the ground up. They have been inspected and tested and carry the same guarantee as to materials and workmanship as a new machine. Perhaps this is the solution to the problems in that job you are figuring.

Northwest Engineering Co.
1865 Steger Building,
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Gentlemen: I am interested in a rebuilt machine of the type checked below. Please send complete information without obligating me in any way.

Name .....

Address .....

City ..... State .....

☐ Shovel ☐ Crane ☐ Dragline ☐ Pullshovel

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**CRUSHERS**—Double roll and Sledge Wedge Crushers, for practically any product. Capacities to 1000 tons an hour.

**SUPER DRY PANS**—For especially large tonnages.

**WASHERS AND SCRUBBERS**—Steel log Washers; scrubbers, cylinder washers, sand drags and washing screens.

**DRYERS**—Revolving cylindrical, of various sizes.

**JIGS**—For concentrating and beneficiating hematite and manganese ores.

**SCREENS**—Cylindrical and conical screens of any size and capacity.

**HOISTS, ELEVATORS AND CONVEYORS**—Electric, friction and gravity hoists, steel conveyors of different sizes and capacities.

**McLanahan & Stone Corp.**
Hollidaysburg, Pa.



**Perforated Metals—Screens of All Kinds—For Sand, Gravel, Stone, Etc.**

MATERIAL IN STOCK
PROMPT SHIPMENT

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2435 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.


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## COMPLETE HYDRAULIC DREDGES

SAND AND GRAVEL DREDGING PUMPS
AGITATING MACHINERY
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STEEL HULLS • PONTOONS
PIPE LINE ACCESSORIES

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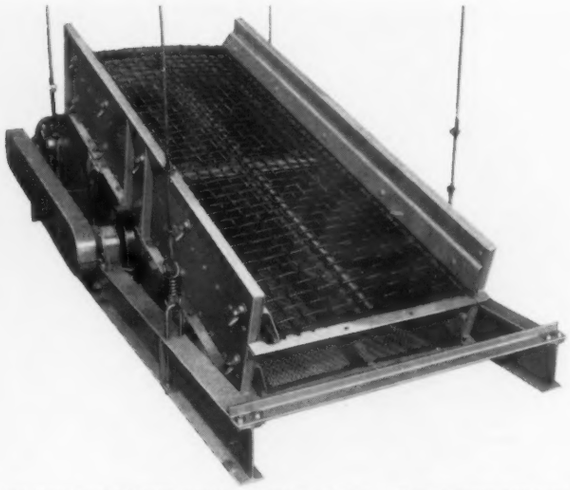
701-745 KENTUCKY AVENUE .. .. .. .. INDIANAPOLIS, IND.

# Low-Cost, DEPENDABLE SCREENING with the LINK-BELT VIBRATING SCREEN



Link-Belt Double-Deck "PD" Vibrating Screen. The screen's sub-frame can be supported from below or hung by cables from above.

The Link-Belt Vibrating Screen is made for both fine and coarse screening, in sizes and types to fit almost any capacity or service condition.

The "PD" type illustrated, is a heavy duty positive eccentric drive screen for large capacity coarse screening. It is a well designed unit, with features that reduce power and maintenance costs, and produce a uniform product. Made in convenient sizes, with single or multiple screening decks. The screening angle can be quickly changed to suit screening conditions. Send for Catalog.

**LINK-BELT COMPANY**

PHILADELPHIA - INDIANAPOLIS - CHICAGO
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*Offices in Principal Cities*

1947

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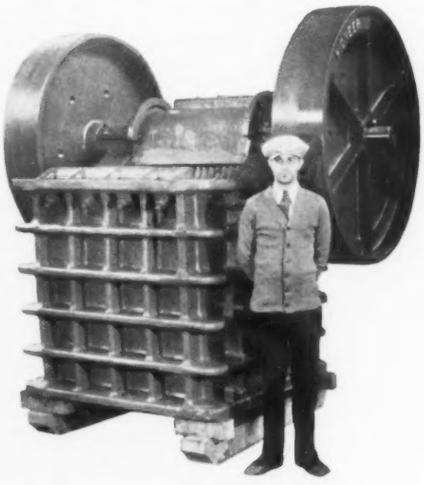


## PIONEER OFFERS FOR 1934

## 2436 PRIMARY CRUSHER

WITH FORCED FEED JAW ACTION
OIL PUMP CIRCULATING SYSTEM
ELECTRIC CAST STEEL BASE
GREATER STRENGTH LESS WEIGHT

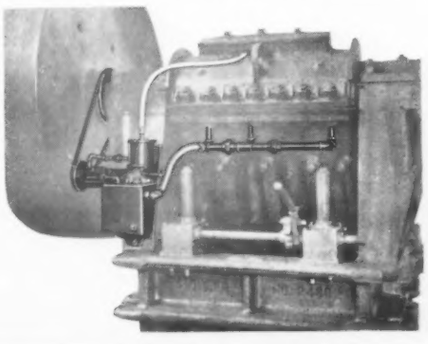
Its ability to handle rock from one yard shovel affords greater economy in blasting costs.
Its overhead eccentric results in crowding to the discharge opening giving larger capacity.
The oil pump circulating system gives positive lubrication and longer life.
The electric cast steel base and pitman have greater strength with less weight.

| | |
|---|---|
| Size of Jaw Opening | 24" x 36" |
| Minimum Setting of Jaws | 3" |
| Maximum Setting of Jaws | 6" |
| Size of Flywheels | 60" x 12½" |

Eccentric Shaft—Heat Treated Chrome Nickel Steel, Machined and Ground: 9" diameter at the center, 7" diameter at the bearing.

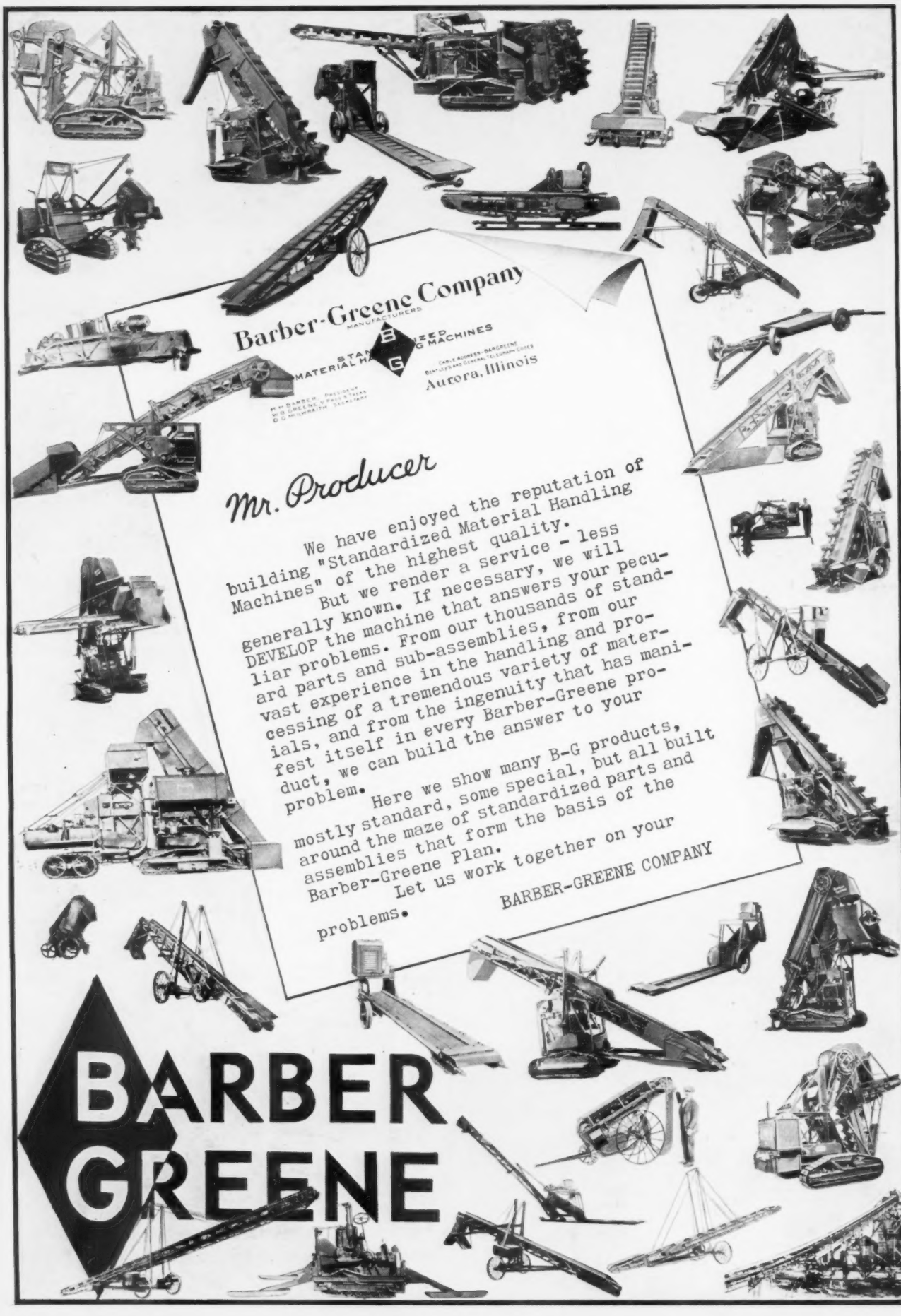
Jaws 48" Deep—Manganese Steel—Reversible type.
Adjusting Mechanism—Fully enclosed geared type with ratchet control.
Closures—Patented Pioneer Closures, preventing dirt from getting into the Pitman and Main Bearings.
Total Weight—32,000 lbs.

REAR VIEW SHOWING THE OIL PUMP CIRCULATING SYSTEM



## PIONEER GRAVEL EQUIPMENT MFG. CO.

1515 Central Ave. Minneapolis, Minn.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STANDARDIZED
MATERIAL HANDLING MACHINES
Aurora, Illinois
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We have enjoyed the reputation of building "Standardized Material Handling Machines" of the highest quality. But we render a service - less generally known. If necessary, we will DEVELOP the machine that answers your peculiar problems. From our thousands of standard parts and sub-assemblies, from our vast experience in the handling and processing of a tremendous variety of materials, and from the ingenuity that has manifest itself in every Barber-Greene product, we can build the answer to your problem.
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Let us work together on your problems.
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